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ABSTRACT

This teacher's guide is one of a series of publications focusing on the occupational preparation of persons with special education needs. The material was developed and tested by cooperating teachers over a period of three years. Task analysis information is presented using occupational descriptions from the Dictionary Titles, covering entry level occupations generally available in Michigan. Instructional task modules are presented in detail under the headings: behavioral task knowledges/task skills, instructional methods, task-related competencies, instructional materials, basic information for cooperative teaching (language of the task and quantitative concepts), and suggestions. An instructional materials bibliography is included, followed by two appendixes, an instructional materials code indicating probable learning sensations, and a task-related competencies code. This guide covers the 20 tasks common to the manufacturing cluster, together with 9 tasks for four selected entry occupations in the combination welding subcluster, 11 tasks for five selected entry occupations in the machine tool processes subcluster, and 22 tasks for one selected entry occupation in the soft material processes subcluster. (SA)

Manufacturing

Cluster Guide

ED 091 519

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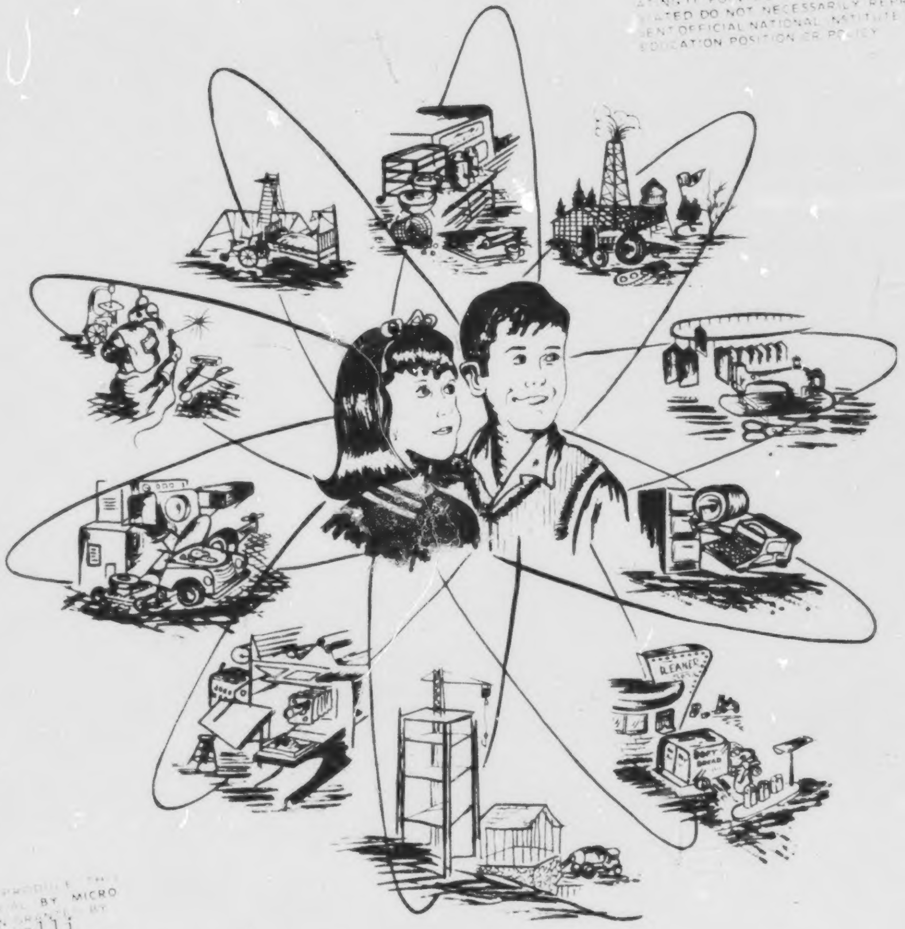

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An Instructional Resource Guide to Enhance Cooperative Vocational Education / Special Education Teaching

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MANUFACTURING CLUSTER

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SPECIAL EDUCATION PROJECT

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PREFACE

This teacher's guide is one of a series of publications focusing upon the occupational preparation of persons with special education needs. It is intended to be used jointly by concerned teachers as they work collectively to serve students with unique educational problems. Developed and tested by cooperating teachers, these materials represent the culmination of three years of intensive listening, communication, cooperation, and positive action between vocational and special education teachers. If the exciting ideas in these pages are actively and cooperatively implemented, the impact upon our young people could well be tremendous.

ACKNOWLEDGEMENTS

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The occupational task analysis data/information for the Manufacturing Cluster was obtained from the Ingham Intermediate School District. In early 1973, this intermediate school district completed a comprehensive task analysis project covering 50 different occupations in a three-county area. The key analysis occupations for this cluster are identical to those manufacturing occupations identified and analyzed by the Ingham Intermediate School District project.

Acknowledgement is due the Ingham Intermediate School District and the Michigan Department of Education for arranging the release of this data.

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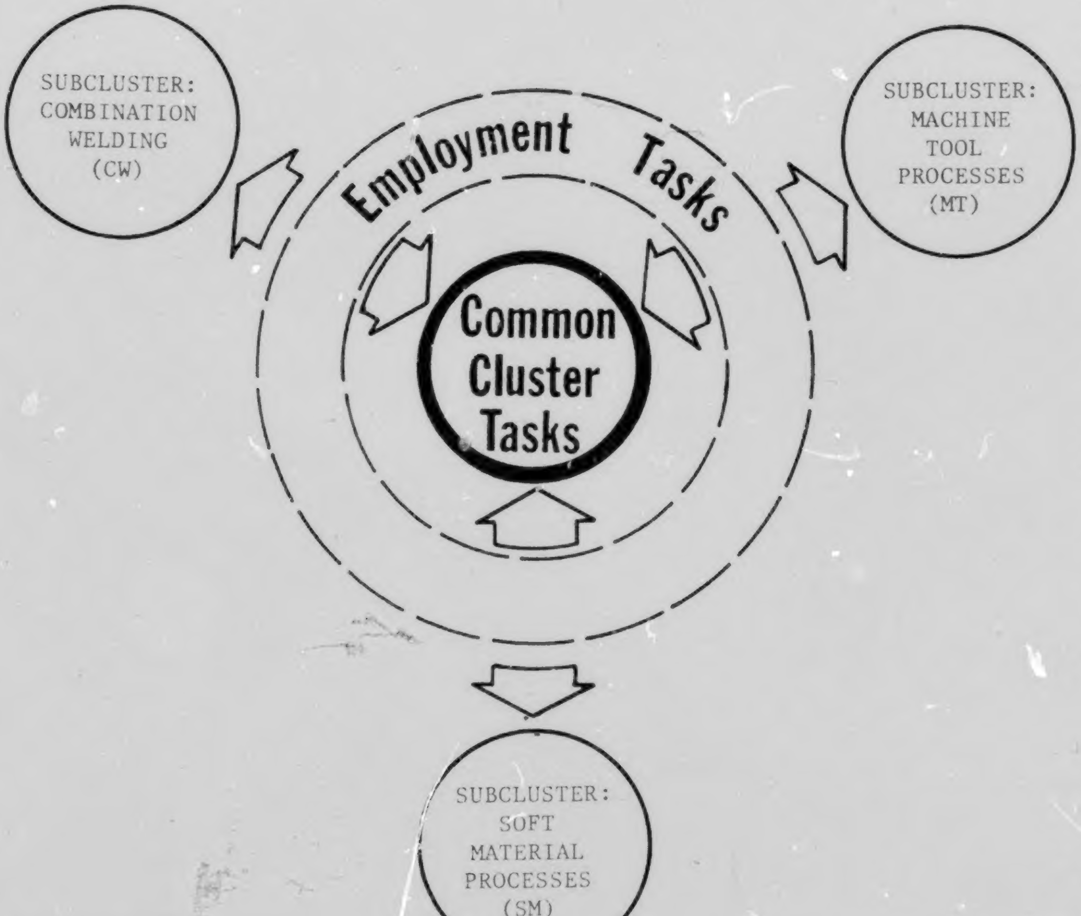
INSTRUCTIONAL TASK MODULES

MANUFACTURING CLUSTER (MFG)

- Common Cluster Tasks (CT)
- Subcluster: combination welding (CW)
- Subcluster: machine tool processes (MT)
- Subcluster: soft materials processes (SM)

CLUSTER ORGANIZATION

MANUFACTURING CLUSTER (MFG)



CLUSTERED OCCUPATIONS

CLUSTER: MANUFACTURING

OE PROGRAM CODE	SUBCLUSTER TITLE	D.O.T.	OCCUPATIONAL TITLES
17.230603	Combination Welding	*812.884	Welder, Combination
		812.884	Welder, Repair
		810.884	Welder, Arc
		810.782	Welder, Spot
17.2302	Machine Tool Processes	*600.280	Machinist
		*609.885	Production Machine Operator
		504.782	Heat Treater
		604.885	Lathe Operator, Production
		705.884	Bench Grinder
		616.885	Multi-Operation Forming-Machine Operator
17.3601	Soft Material Processes	*669.782	Woodworking Machine Operator

*Key Analysis Occupation

DICTIONARY OF OCCUPATIONAL TITLES

The following is a list of occupational descriptions taken from the third edition (1965) of the Dictionary of Occupational Titles. These represent the key analysis occupations for the Manufacturing Cluster.

Each occupational title represents an entry-level occupation which is generally available (in demand) across the state of Michigan at the present time. However, teachers and curriculum planners must carefully study the generalizability of this information/data to their specific community. Local or regional manpower information and data must be carefully reviewed and analyzed in making decisions related to local vocational program offerings and specific curriculum or course content.

812.884 *WELDER, COMBINATION (Combination Welder)* Welds metal parts together, according to layouts, blueprints, or work orders, using both gas welding or brazing and any combination of arc welding processes. Performs related tasks, such as flame cutting and grinding. May repair broken or cracked parts, fill holes, and increase size of metal parts. May position and clamp together components of fabricated metal products preparatory to welding, but does not perform layout, fitting, and alining.

600.280 *MACHINIST* Sets up and operates machine tools, and fits and assembles parts to make or repair metal parts, mechanisms, tools, or machines, applying knowledge of mechanics, shop mathematics, metal properties, and layout machining procedures: Studies specifications, such as blueprint, sketch, or description of part to be replaced, and plans sequence of operations. Measures, marks, and scribes dimensions and reference points to lay out stock for machining. Sets up and operates lathe, milling machine, shaper, or grinder to machine parts to specifications, and verifies conformance of part to specifications, using measuring instruments. Positions and secures parts on surface plate or worktable with such devices as vises, files, scrapers, and wrenches, to fit and assemble parts to assemblies or mechanisms. Verifies dimensions and alinement with measuring instruments, such as micrometers, height gages, and gage blocks. May operate mechanism or machine, observe operation, or test it with inspection equipment to diagnose malfunction of machine or to test repaired machine. May develop specifications from general description and draw or sketch product to be made. May be required to have experience with particular products, machines, or function as construction or repair, and be designated accordingly.

609.885 *PRODUCTION-MACHINE OPERATOR* Tends any of variety of machine tools, such as lathes, drill presses, milling machines, grinders, or special-purpose machines to machine metal workpieces to specifications on production basis: Lifts workpiece manually or with hoist and positions and secures it in fixture, or loads automatic feeding device. Starts machine, engages feed, and observes operation. Verifies conformance of machined workpieces to specifications, using such instruments as preset comparator, fixed gages, calipers, or micrometer. May move controls to adjust machine. Changes worn cutting tools, using wrenches. May operate bench grinder to sharpen tools. May machine plastics or other nonmetals. May tend machines and equipment other than machine tools, such as welders. May be required to transfer from one type of machine to another as situation demands. May be required to have experience with particular material, product, or size, type or trade name of machine and be designated accordingly.

669.982 *WOODWORKING-MACHINE OPERATOR* Operates one or more hand - or power - fed woodworking machines to surface, size, or joint lumber or to cut tongues, grooves, bevels, beads, or molding patterns: Selects and installs cutting heads according to pattern to be cut and work order, using wrenches and gages. Turns handwheels to expose cutting heads and adjust guides, pressure bars, and table levels according to depth and position of cuts and stock dimensions. Starts machine, places board on machine table with edge against guide fence and pushes it over cutting knives and through machine or inserts board into automatic feed mechanism that carries it through machine. Verifies cuts, angles, and dimensions to insure conformance with specifications, using gages, square, rule, or template.

CLUSTER COMMONALITY ANALYSIS

MANUFACTURING CLUSTER

SUBCLUSTERS (MFG)

COMMON CLUSTER TASKS

INSTRUCTIONAL TASK MODULES

		COMBINATION WELDING	MACHINE TOOL PROCESSES	SOFT MATERIAL PROCESSES
CT01	Select and wear appropriate personal safety equipment	x	x	x
CT02	Recognize safety color designations	x	x	x
CT03	Identify industrial safety hazards	x	x	x
CT04	Develop and maintain safety consciousness	x	x	x
CT05	Operate safety equipment	x	x	x
CT06	Record and/or report accidents	x	x	x
CT07	Use and interpret measuring rules	x	x	x
CT08	Use and interpret miscellaneous measuring tools	x	x	x
CT09	Select and use layout tools	x	x	x
CT10	Perform basic layouts	x	x	x
CT11	Perform preventive maintenance on hand tools	x	x	x
CT12	Sharpen and recondition hand tools	x	x	x
CT13	Identify metals by spark testing	x	x	
CT14	Test the mechanical properties of metals and welds	x	x	
CT15	Use and interpret micrometers and calipers	o	x	o
CT16	Use and interpret gauges	o	x	
CT17	Operate a hardness testor	o	x	
CT18	Perform basic heat treatment processes	o	x	
CT19	Maintain abrasive equipment	o	x	
CT20	Use and interpret vernier measuring tools		x	

x - essential
o - desirable

SUBCLUSTER COMMONALITY ANALYSIS

Combination Welding

SELECTED ENTRY OCCUPATIONS

INSTRUCTIONAL TASK MODULES		WELDER, COMBINATION	WELDER, REPAIR	WELDER, ARC	WELDER, SPOT
CW01	Set up welding equipment	x	x	x	x
CW02	Select the appropriate welding process	x	x	x	x
CW03	Prepare welding materials	x	x	x	x
CW04	Perform gas welding and cutting	x	x		
CW05	Perform arc welding operations	x		x	
CW06	Perform resistance welding	x			x
CW07	Perform TIG and MIG welding	x		o	
CW08	Perform soldering	x			
CW09	Perform brazing	x			

x - essential
o - desirable

SUBCLUSTER COMMONALITY ANALYSIS

Machine Tool Processes

INSTRUCTIONAL TASK MODULES		MACHINIST	PRODUCTION MACHINE OPERATOR	LATHE OPERATOR, PRODUCTION	BENCH GRINDER	MULTI-OPERATION FORMING-MACHINE OPERATOR
MT01	Operate a cut off saw	o	x	o	o	o
MT02	Operate a pedestal grinder	x	x	x	x	x
MT03	Operate a shaper	x	x			
MT04	Operate a milling machine	x	x			
MT05	Operate a machine lathe	x	x	x		
MT06	Operate a drill press	x	x	o		
MT07	Operate a surface grinder	x	x		o	
MT08	Use sheet metal handtools	o	o			x
MT09	Operate sheet metal machines	o	o			x
MT10	Perform general machine maintenance	x	x	x	x	x
MT11	Lubricate machinery and equipment	x	x	x	x	x

(Column group heading: SELECTED ENTRY OCCUPATIONS)

x - essential
o - desirable

SUBCLUSTER COMMONALITY ANALYSIS

SOFT MATERIAL PROCESSES

Note: The instructional task modules in this subcluster were not derived from an occupational task analysis model. Each of the modules was identified, developed, and tested by industrial arts teachers with the philosophical contention that these tasks represent essential prerequisite skills for successful achievement in specialized or vocational, manufacturing-related instructional programs. Effective implementation of these task modules may be realized by integrating them into a group manufacturing/mass production activity or individually designed and produced products.

SELECTED ENTRY OCCUPATION

	INSTRUCTIONAL TASK MODULES	WOODWORKING-MACHINE OPERATOR
SM01	Identify different wood materials	x
SM02	Use measurement and layout tools	x
SM03	Cut stock with handsaw	x
SM04	Cut stock with portable power saws	x
SM05	Use planing, smoothing, and shaping hand tools	x
SM06	Use drilling and boring tools	x
SM07	Use fastening and disassembly tools	x
SM08	Operate power hand tools	x
SM09	Maintain hand and power tools	x
SM10	Utilize linear, square, and cubic measures of materials	x
SM11	Operate power sanders	x
SM12	Operate power routers	x
SM13	Operate a drill press	x
SM14	Operate a jig saw	x
SM15	Operate a surface planer	x

x - essential
o - desirable

SUBCLUSTER COMMONALITY ANALYSIS

Soft Material Processes

INSTRUCTIONAL TASK MODULES		SELECTED ENTRY OCCUPATION: WOODWORKING-MACHINE OPERATOR
SM16	Operate a jointer	x
SM17	Operate a circular saw	x
SM18	Operate a band saw	x
SM19	Operate a wood lathe	x
SM20	Operate a wood shaper	x
SM21	Employ wood fasteners	x
SM22	Apply selected wood finishes	x

x - essential
o - desirable

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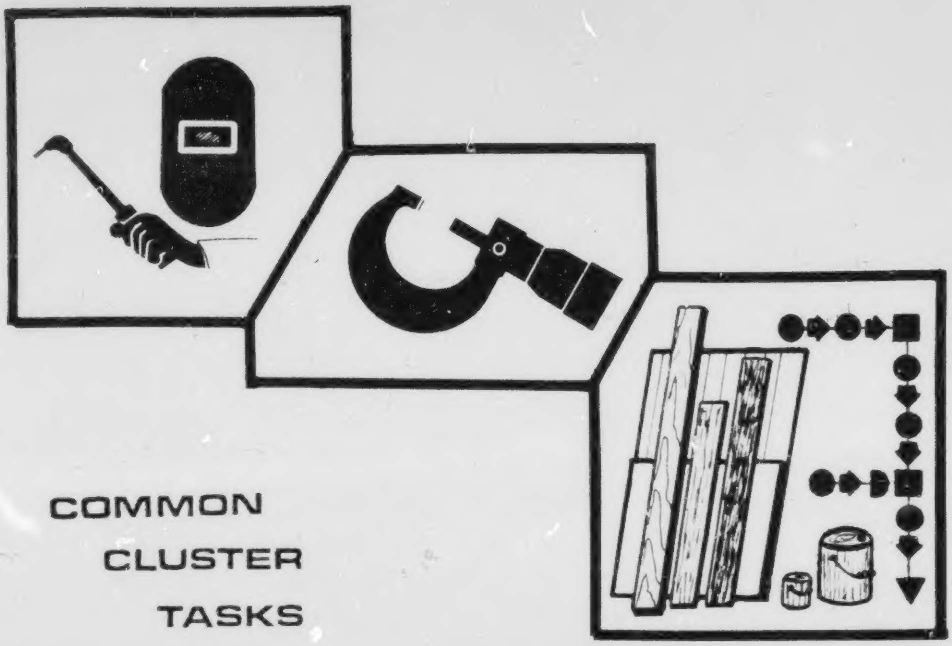
TASK ANALYSIS INFORMATION

MANUFACTURING CLUSTER

- CLUSTER ORGANIZATION
- CLUSTERED OCCUPATIONS
- DICTIONARY OF OCCUPATIONAL TITLES
- CLUSTER COMMONALITY ANALYSIS
- SUBCLUSTER COMMONALITY ANALYSIS: COMBINATION WELDING
- SUBCLUSTER COMMONALITY ANALYSIS: MACHINE TOOL PROCESSES
- SUBCLUSTER COMMONALITY ANALYSIS: SOFT MATERIAL PROCESSES



COMMON CLUSTER TASKS

INSTRUCTIONAL TASK MODULES

CT01 Select and wear appropriate personal safety equipment

CT02 Recognize safety color designations

CT03 Identify industrial safety hazards

CT04 Develop and maintain safety consciousness

CT05 Operate safety equipment

CT06 Record and/or report accidents

CT07 Use and interpret measuring rules

CT08 Use and interpret miscellaneous measuring tools

CT09 Select and use layout tools

CT10 Perform basic layouts

CT11 Perform preventive maintenance on hand tools

CT12 Sharpen and recondition hand tools

CT13 Identify metals by spark testing

CT14 Test the mechanical properties of metals and welds

CT15 Use and interpret micrometers and calipers

CT16 Use and interpret gauges

CT17 Operate a hardness testor

CT18 Perform basic heat treatment processes

CT19 Maintain abrasive equipment

CT20 Use and interpret vernier measuring tools

COMMON CLUSTER TASKS

TASK: Select and wear appropriate personal safety equipment

Code: MFG - CT01

Student Name: ____________

Student Progress: Introduced / Involved / Productive / Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify the use, need, or application for each of the different pieces of personal safety equipment: a. head protection b. glasses c. gloves d. shoes e. protective clothing f. ear plugs g. respirators. 2. select properly fitting personal safety equipment. 3. demonstrate the appropriate selection and application of specific personal safety equipment for a given industrial situation.	• Teacher directs a demonstration of personal safety equipment use in the shop. • Students view films, filmstrips, and posters related to personal safety equipment. • Note: One of the positive ways to teach this task is by example.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE	"Knowing Is Not Enough"	8	21
A 1			
NUMBERS	"It's Up to You"	8	3
	Wall posters illustrating use of personal safety equipment	16	14
APPLICATION			
	"Eye Protection"	10	6
C 8			
PHYSICAL	"Safety in the Shop"	8	11

COMMON CLUSTER TASKS

Code: MFG - CT01 TASK: Select and wear appropriate personal safety equipment

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Hard hat Impact resistant Safety lens Filter Safety goggles Welding goggles Welding hat Face shield Gloves	Recognize proper sizes of equipment and "gear" to be used.	• Discuss accidents cause and effects and how these accidents might have been prevented.

Supportive Instructional Materials:

COMMON CLUSTER TASKS

Sheet 1 of 1

TASK: Recognize safety color designations

Code: MFG - CT02

Student Name: ____________

Student Progress: Introduced | Involved | Productive | Employable

Behavioral Task Knowledges/Task Skills

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. identify by name the organization standardizing color code systems.

2. identify the specific safety designation or meaning for the following colors:
   a. red
      1) fire protection equipment
      2) danger
      3) emergency stops
   b. orange
      1) alert
   c. yellow
      1) caution
   d. green
      1) first aid and safety equipment
   e. blue
      1) equipment controls
   f. purple
      1) radiation hazards
   g. black or white
      1) stripes or checks indicates housekeeping areas.

3. identify the safety meanings for standard color accident prevention signs:
   a. red - danger
   b. yellow - caution
   c. green - safety instructions
   d. blue - protection materials.

Instructional Methods

- Students designate the safety areas of shop and machines using appropriately colored adhesive tape.
- Students view films and filmstrip related safety color designations.
- Teacher concentrates his effort with students having difficulty.

Task-Related Competencies / Instructional Materials

Task-Related Competencies	Title	Media	Bib.
KNOWLEDGE	"Our Senses: What They Do For Us"	8	19
A 9			
NUMBERS	"Safety in the Shop"	8	19
	"Safety in the Shop"	10	11
APPLICATION	"Listening with Your Senses"	8	6
PHYSICAL			

COMMON CLUSTER TASKS

Code: MFG - CT02 TASK: Recognize safety color designations

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	• Flash cards color coded to safety meaning.
Danger Emergency Safety stripes Decode - Fire Equipment red orange yellow green blue purple black or white Decode - Standard Accident Prevention Signs red yellow green blue		

Supportive Instructional Materials:

COMMON CLUSTER TASKS

Code: MFG - CT03

TASK: Identify industrial safety hazards

Student Name: ____________

Student Progress: Introduced | Involved | Productive | Employable

Behavioral Task Knowledges/Task Skills

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. identify the general types of safety hazards:
   a. mechanical
   b. electrical
   c. health.
2. name and describe several potential mechanical hazards in a given industrial setting:
   a. defective tools, materials, and equipment
   b. improperly guarded or unguarded equipment
   c. faulty arrangements
   d. hazardous procedures
   e. undesirable work conditions
   f. unsafe dress or apparel
   g. unsafe building conditions
   h. poor housekeeping.
3. name and describe several potential electrical hazards in a given industrial setting:
   a. defective equipment
   b. unsafe practices
   c. lack of knowledge
4. name and describe several potential health hazards in a given industrial setting:
   a. chemical agents (dust, fumes, etc.)
   b. biological
   c. physical agents.

Instructional Methods

- Students conduct safety check survey to identify potential safety hazards.
- Students view films, filmstrips, and posters.

Task-Related Competencies

KNOWLEDGE
A 1,4,10
NUMBERS

APPLICATION
C 5,6
PHYSICAL

Instructional Materials

Title	Media	Bib.
"Safe Shop"	8	6
Posters	16	
"Safety in the Shop"	8	6
"Eye Protection"	10	32
"Safety Inspection"	10	32
"Training for Emergencies"	10	32

COMMON CLUSTER TASKS

Code: MFG - CT03 TASK: Identify industrial safety hazards

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Ground Oxygen Short circuit Ground Toxic Explosion Volatile Mechanical Electrical Fumes Gases Speeds Feeds Vapors	Different connotation of meaning, mechanical as opposed to electrically operated machines.	• Students compile lists of potential hazards.

Supportive Instructional Materials:

COMMON CLUSTER TASKS

TASK: Develop and maintain safety consciousness

Code: MFG - CT04

Student Name: ______________________

Student Progress: Introduced	Involved	Productive	Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
				Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. describe and assess the value of holding positive safety attitudes: a. financial values b. self protection c. job appreciation values. 2. develop a safety consciousness awareness and attitude among others in a given industrial setting by: a. teaching by example b. avoid warnings and threats c. avoid fear approaches d. use positive/negative instruction e. use vital correlations f. employ group dynamics g. enforce safety rules.	• Teacher initiates a class discussion of the identified concepts at an appropriate time, i.e. following a shop incident involving safety-related misconduct. • Students view films, posters, and filmstrips. • Teacher makes contact with each student during the class period.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE	Safety posters	16	
A 9	"How to Have an Accident at Work"	8	13
NUMBERS	"How to Have an Accident at Home"	8	13
APPLICATION	"Safety in the Shop"	10	11
C 8			
PHYSICAL			

COMMON CLUSTER TASKS

Code: MFG - CT04 TASK: Develop and maintain safety consciousness

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Example Warning Fear Safety rules Codes Protection Values Enforce Respect Concern Self preservation	Estimate some of the costs of carelessness in loss of time, dollar expense, and personal discomfort.	• Discuss values of positive attitudes toward safe procedures in shop. The product of unsafe procedures results in pain, loss of time, destruction of equipment and material.

Supportive Instructional Materials:

COMMON CLUSTER TASKS

TASK: Operate safety equipment

Code: MFG - CT05

Student Name: ____________

Student Progress: Introduced / Involved / Productive / Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify common pieces of safety equipment: a. fire extinguishers d. lighting. b. containers c. exhaust systems 2. recognize different types of fires: a. Type A fire c. Type C fire. b. Type B fire 3. recognize and describe the application or use of different fire extinguishers: a. water type d. carbon dioxide b. soda-acid e. dry chemical. c. foam 4. demonstrate the procedures for maintaining and checking fire extinguishers. 5. demonstrate the procedures for operating specific types of fire extinguishers. 6. identify and describe the appropriate safety container for combustible material, inflammable liquids, and other material. 7. identify and describe the importance and use of safety engineered exhaust systems. 8. operate exhaust systems, following prescribed procedures.	• Students simulate use and operation of fire extinguishers and safety equipment following a fireman's demonstration. • Students view films and filmstrips. • Para-professionals provide sustained involvement with students having difficulty with this task.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 7,9	"Fire"	8	19
NUMBERS	"Fire: What Makes It Burn"	8	19
	"Fires and Wires"	8	19
APPLICATION C 4,5,7,8	"Maintaining a Safe Shop"	10	32
PHYSICAL D 1, 2c, 3			

COMMON CLUSTER TASKS

Code: MFG - CT05 TASK: Operate safety equipment

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Type A fire Type B fire Type C fire Fire extinguishers Exhaust system Chemicals used in fire extinguishers: water soda-acid foam carbon dioxide dry chemical Combustion Spontaneous combustion Flammable		• Help custodian fill and check school fire extinguishers.

Supportive Instructional Materials:

COMMON CLUSTER TASKS

TASK: Report and/or record accidents

Code: MFG - CT06

Student Name: ____________________

Student Progress: Introduced	Involved	Productive	Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
				Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify several basic reasons for reporting industrial accidents. 2. recognize the types of reportable accidents: a. damage to material or equipment b. near-injury to personnel c. minor injury d. disabling injury. 3. name the common and essential elements of an accident report form: a. who b. what c. where d. when e. why. 4. accurately complete a hypothetical accident report in consultation with a supervisor.	o Students practice filling out reports for mock accident descriptions. o Students collect and review/discuss accident reporting forms from local businesses and industries.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 1 NUMBERS APPLICATION C 3,5,6,8 PHYSICAL	Accident report forms	1	

COMMON CLUSTER TASKS

Code: MFG - CT06 TASK: Report and/or record accidents

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	• Use school accident forms, let students help fill one out.
Splinter Cut Abrasion First aid Infection Burn Puncture Scratches Bruise Sprain Splinter	Time of injury Extent of injury Observe vital signs: breathing bleeding	

Supportive Instructional Materials:

COMMON CLUSTER TASKS

TASK: Use and interpret measuring rules

Code: MFG - CT07

Student Name: ______________

Student Progress: Introduced	Involved	Productive	Employable

Behavioral Task Knowledges/Task Skills

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will :

1. identify by name the different types of steel rules:
   a. pocket rule
   b. narrow rule
   c. flexible rule
   d. slide caliper rule
   e. hook rules.

2. reading the measuring rule to
   a. interpret the following graduations:
      1) 1/2"
      2) 1/4"
      3) 1/8"
      4) 1/16"
      5) 1/32".
   b. interpret decimal fractions of:
      1) 10ths
      2) 20ths
      3) 50ths
      4) 100ths.

3. properly store and care for steel measuring rules:
   a. protection of measuring edge.
   b. storage conditions.

Instructional Methods

- Teacher provides a basic demonstration of the different measuring rules and techniques.
- Students view filmstrips of math concepts.
- Students measure and record measurements of a variety of teacher-selected objects.

Task-Related Competencies

KNOWLEDGE
A 3,8,9

NUMBERS
B 2a,b, 4a

APPLICATION
C 7

PHYSICAL
D 1a,b,c,d,e
2a,b
3g

Instructional Materials

Title	Media	Bib.
Ruler (9890) large demo ruler	2	17
Fraction-Decimal-Percent (9870)	2	17
"Four Inch Graduation"	10	25
"Try Square, Combination and Steel Square"	10	25
"Zig Zag and Zig Zag Extension Rule"	10	25
"Bench and Folding Rules"	10	25
"Shop Measuring Instruments"	10	6
"Bases of Measurement" series	12	7
"Building Concepts in Mathematics"	10	8
"Using Modern Mathematics"	10	16

COMMON CLUSTER TASKS

Code: MFG - CT07 TASK: Use and interpret measuring rules

Basic Information for Cooperative Teaching: Language of the Task	Basic Information for Cooperative Teaching: Quantitative Concepts	Suggestions:
Steel rule Pocket rule Narrow rule Flexible rule Slide calipers or Vernier calipers Scratch awl Tri-square Combination square Inside measurement Outside measurement United States Standard Gauge American Standard Gauge	Distinguish the identified gradations (1/2", 1/4", 1/8", 1/16", 1/32") on various rules. Determine the decimal equivalent of a fractional part of an inch. Have the students convert the fractional part of the inch to the decimal equivalent by a scale found on many rules.	• Give students hands-on experience by measuring objects about the room.

Supportive Instructional Materials:

Steel rules - labeled
Blow-up of rule showing fractional breakdown
Table of decimal equivalents

COMMON CLUSTER TASKS

TASK: Use and interpret miscellaneous measuring tools

Code: MFG - CT08

Student Name: ____________

Student Progress: Introduced / Involved / Productive / Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify by name the different types of miscellaneous measuring tools: a. feeler gauge b. screw pitch gauge c. fillet/radius d. drill rod e. hole gauge f. telescoping gauge. 2. demonstrate the appropriate procedures/techniques for using each of the identified measuring tools. 3. properly store and care for each of the identified measuring tools. 4. read and interpret measurements and dimensions from application of the identified tools.	• Teacher provides a demonstration on use of the identified measuring tools. • Students review and study wall charts and filmstrips. • Students practice use of the identified tools by measuring teacher-selected objects.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 3,8,9 NUMBERS B 2a,b, 4a, 5 APPLICATION C 7 PHYSICAL D 1a,b,c,d 2b 3	Wall charts "Layout Tools and Measuring Devices"	16 10	39 32

COMMON CLUSTER TASKS

Code: MFG - CT08 TASK: Use and interpret miscellaneous measuring tools

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Feeler gauge Screw pitch gauge Drill rod Hole gauge Telescoping gauge	Determine essential measuring and equivalency scales by contacting vocational instructor. Recognize some differences between English system of measuring and the metric system.	• Name, look at, handle and manipulate various measuring tools. • See vocational instructor to determine system of measuring in local area.

Supportive Instructional Materials:
Essential measuring tools, labeled for identifying purposes.

COMMON CLUSTER TASKS

TASK: Select and use layout tools

Code: MFG - CT09

Student Name: ____________________

Student Progress: Introduced	Involved	Productive	Employable	Behavioral Task Knowledges/Task Skills
				Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify by name each of the following layout tools: a. layout dye b. scriber c. dividers d. trammel points e. hermaphrodite caliper f. surface gage g. straight edge h. parallels i. V-blocks j. angle plate k. squares 1) steel square 2) double square 3) combination sets 4) square head 5) center head 6) protractor bevel l. protractor depth gauge m. plain steel protractor. 2. demonstrate the appropriate procedures/techniques for using the identified layout tools. 3. properly store and care for layout tools.

Instructional Methods

- Teacher provides a small group demonstration on the appropriate use of the identified layout tools.
- Students view filmstrips and films for orientation to use of layout tools.
- Para-professionals provide sustained involvement with students having difficulty with this task.
- Teacher makes contact with each student during the class period.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 3,6,9	"Layout and Measurement"	10	16
NUMBERS B 2a,b,4a,5,6	"T Bevel and Angle Divider"	10	25
APPLICATION C 6	"Layout Tools for Metal Work"	8	34
PHYSICAL D 1a,b,c,d 2b 3c,g			

COMMON CLUSTER TASKS

Code: MFG - CT09 TASK: Select and use layout tools

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Scriber Dividers Trammel point Hermaphrodite caliper Surface gauge Parallels V-block Angle plate Squares	Parallel learning to use layout tools with the involvement of the student's use of these tools in the vocational class. This means a way be devised for quick communication with the vocational instructor as the need arises.	• It is essential that the supportive teachers work closely with vocational teachers.

Supportive Instructional Materials:

COMMON CLUSTER TASKS

TASK: Perform basic layouts

Code: MFG - CT10

Student Name: ______________

Student Progress: Introduced / Involved / Productive / Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. describe the basic purpose of a systematic layout process. 2. perform the following job skills in preparing basic layouts: a. coat metals with layout dye b. layout overall dimensions c. locate and scribe a baseline or mark for specific dimensions d. locate centers of arcs and circles e. scribe arcs and circles with dividers or trammel points f. layout angular lines by use of protractor or by determining the end points of a line g. cut materials to overall dimensions h. clean work surfaces of oil, grease, and dirt i. use prick punches to mark hole centers j. expand prick punch marks with center punches or center drills k. layout and mark the remaining openings or cuts.	• Teacher provides a demonstration of basic layout procedures for wood, metal, and plastic. • Students view filmstrip for orientation to layout concepts. • Students perform and practice layout techniques in conjunction with the fabrication of a given product. • Teacher encourages small peer group cooperation and interaction.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 3,7,8,9	"Layout and Measurement"	10	16
NUMBERS B 2a,b,4a,5,6	"Layout Tools for Metal Work"	8	34
APPLICATION C 6,8	"Layout and Cutting"	10	11
PHYSICAL D 1, 2c			

COMMON CLUSTER TASKS

Code: MFG - CT10 TASK: Perform basic layouts

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Layout dye Overall dimensions Square material Scriber Prick punch Compass Dividers Trammel	Check with the vocational instructor to make sure of the immediate need for measuring skills but one must be able at least to determine a point, to center, to disect an arc, etc. Layout angles by use of a protractor. Layout angles by use of end points.	• Practice on paper, on styrofoam. • Compare layout dye to carbon or chalk dust or wax crayon on paper.

Supportive Instructional Materials:

Packet of geometric construction tools, paper, styrofoam, etc.

COMMON CLUSTER TASKS

TASK: Perform preventive maintenance on handtools

Code: MFG - CT11

Student Name: ____________

Student Progress: Introduced | Involved | Productive | Employable

Behavioral Task Knowledges/Task Skills

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. demonstrate the appropriate techniques for maintaining the following handtools:
   a. marking gages
   b. squaring a square
   c. planes
      1) knobs and handles
      2) frog
      3) lever and lever cap screw
      4) bed
      5) plane iron
      6) cap iron
   d. hand saws
      1) saw handles
      2) replacing saw handles
      3) removing kinks from saw blades
   e. bar clamps
      1) maintenance of cross bars
      2) racks for clamps and screws
   f. hand screws
      1) wooden screw clamps
      2) c-clamps
   g. selected hand tools
      1) spiral/rachet screwdriver
      2) center punches, prick punches and nail sets
      3) regular, drift, tapered punches
      4) scratch awls, scribers
      5) soldering coppers
   h. replace tool handles
      1) file handles
      2) wood turning tools
      3) nail hammer
      4) hatchet
      5) sledge
      6) axe.

Instructional Methods

- Students sharpen and maintain selected handtools in the lab throughout the school year.
- Teacher provides a demonstration of tool maintenance procedures and techniques.
- Students view film and/or filmstrip.
- Para-professionals provide sustained involvement with students having difficulty with this task.

Task-Related Competencies

KNOWLEDGE
A 1,2,3,8,9

NUMBERS
B 2a,b

APPLICATION
C 3,5,8

PHYSICAL
D 1a,b,c,d
2a,b
3c

Instructional Materials

Title	Media	Bib.
"Planes"	8	22
"Care and Repair of Hand Tools"	10	11

COMMON CLUSTER TASKS

Code: MFG - CT11   TASK: Perform preventive maintenance on handtools

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Wedge File Sharpen Polish Replace Remove Taper Smooth Straighten Clamp Set	Important to duplicate parts by accurately checking number of replacement parts.	

Supportive Instructional Materials:

COMMON CLUSTER TASKS

TASK: Sharpen and recondition handtools

Code: MFG - CT12

Student Name: ______________

Student Progress: Introduced	Involved	Productive	Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
				Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify, describe, and demonstrate the techniques for sharpening the following tools: a. auger bits 1) caring for lead screw 2) sharpening spur 3) sharpening cutting lip 4) cleaning/straightening auger bits b. wood chisels 1) grinding 2) whetting c. hatchets and axes d. lathe tools 1) parting tool 2) skews 3) correct bevels 4) whetting 5) gauge e. tin snips f. hand and cabinet scrapers g. screwdrivers h. plane iron i. spokeshave j. drills. 2. identify, describe, and demonstrate the techniques for reconditioning: a. screwdrivers b. cold chisels c. cap irons.	• Students sharpen and recondition lab tools throughout the school year. • Students view films and/or filmstrips on tool sharpening techniques. • Teacher encourages small peer group cooperation and interaction. • Teacher makes contact with <u>each</u> student during the class period.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 3,9	"Sharpening Chisels, Plane Irons, and Gauges"	8	22
NUMBERS	"Sharpening Hand Tools"	10	11
APPLICATION C 3,8	"How to Use Planes"	8	25
PHYSICAL D 1a,b,c,d 2a,b			

COMMON CLUSTER TASKS

Code: MFG - CT12 TASK: Sharpen and recondition handtools

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Angle Slip Bevel Hone Lubricate Friction Temper Parallel Vertical Heel Hallow ground	Draw pictures of correct blade angles. Visually estimate the *necessary angles. Accurately measure the *necessary angles. *Determine the angles that are most appropriate for the working edge of these tools by contacting the vocational instructor.	

Supportive Instructional Materials:

Pictures and charts of the tools being worked with, actual tools if possible

COMMON CLUSTER TASKS

TASK: Identify metals by spark testing

Code: MFG - CT13

Student Name: ______________________

Student Progress: Introduced	Involved	Productive	Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
				Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. describe the basic purpose of the spark test. 2. name the four spark characteristics to be observed in a spark test: a. spark color b. spark shape leaving the wheel c. spark quantity d. distance sparks shoot from wheel. 3. describe the following iron and steel sparks to be observed: a. wrought iron b. low carbon steel c. med-carbon steel d. high-carbon steel e. steel alloys. 4. follow a prescribed procedure for spark testing and identifying different metal samples.	• Students identify given samples of different metals by spark testing and recording each. • Para-professionals provide sustained involvement with students having difficulty with this task. • Teacher matches successful and interested students with those who are having difficulty.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 5,6,7,9 NUMBERS APPLICATION C 5,8 PHYSICAL	Metalwork Technology and Practice p. 151-152	13	12

COMMON CLUSTER TASKS

Code: MFG - CT13 TASK: Identify metals by spark testing

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Spark Spark color Spark quantity Spark shoot distance Carbon Steel Alloys	Recognize colors and shades of yellow and burnt orange.	

Supportive Instructional Materials:

COMMON CLUSTER TASKS

TASK: Test the mechanical properties of metals and welds

Code: MFG - CT14

Student Name: ____________

Student Progress: Introduced	Involved	Productive	Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
				Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. define and describe the following physical properties of metals: a. hardness b. tensile strength c. density (relative weight) d. ductility e. malleability f. brittleness. 2. describe a basic method for checking each of the identified properties with a machine or by hand. 3. test several given metal samples for the identified physical properties. 4. describe the basic purposes for testing welded joints. 5. identify and describe the different tests for welded joints: a. tensile strength b. face bend c. root bend. 6. demonstrate the procedures for performing each of the identified weld joint tests on a mechanical testing machine.	• Students are given several samples of different metals and supervised in performing basic tests to determine the physical properties of the samples. • Students prepare a display analyzing the different samples following testing. • Students review portions of illustrated text.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 7,9 NUMBERS B 4b,f APPLICATION C 2,8 PHYSICAL	<u>Metalwork Technology and Practice</u> pp. 153-154	13	12

COMMON CLUSTER TASKS

Code: MFG - CT14 TASK: Test the mechanical properties of metals and welds

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Hardness Tensile strength Density Ductility Malleability Brittleness Fusibility Machinability	Check with the vocational teacher to determine that teacher's need for academic support.	

Supportive Instructional Materials:

COMMON CLUSTER TASKS

TASK: Use and interpret micrometers and calipers

Code: MFG - CT15

Student Name: ____________

Student Progress: Introduced | Involved | Productive | Employable

Behavioral Task Knowledges/Task Skills

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. identify by name the different types of micrometers:
   a. outside micrometer
   b. inside micrometer
   c. jaw-type inside caliper
   d. direct reading micrometer
   e. micrometer depth gauge
   f. screw thread micrometer caliper.

2. identify the parts of a micrometer:
   a spindle
   b. thimble
   c. anvil.

3. demonstrate the procedures for reading a micrometer:
   a. vernier micrometer caliper
   b. inside micrometer
   c. micrometer depth gauge.

4. demonstrate the procedures/techniques for using or operating a micrometer.

5. properly store and care for the micrometer:
   a. maintenance
   b. adjustment
   c. suggestions for handling.

Instructional Methods

- Teacher or para-professional directs a demonstration of use and how to read a micrometer.
- Students view film.
- Students practice micrometer measurement and recording following a activity/problem worksheet.
- Teacher concentrates his effort with students having difficulty.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE			
A 3,8	"Micrometer"	8	19
NUMBERS	"Micrometers"	12	7
B 2a,b, 4a			
APPLICATION			
C 3,8			
PHYSICAL			
D 1a,b,c,d 2b			

COMMON CLUSTER TASKS

Code: MFG - CT15 TASK: Use and interpret micrometers and calipers

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Micrometer Calipers Vernier	Practice use and interpretation of tools.	• Borrow micrometer and calipers from Metal Shop. Help student name parts and measure paper, cardboard, slate, chalk, etc.

Supportive Instructional Materials:

Actual measuring equipment

COMMON CLUSTER TASKS

TASK: Use and interpret gauges

Code: MFG - CT16

Student Name: ____________

Student Progress: Introduced	Involved	Productive	Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
				Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. describe the basic purpose of gauging. 2. identify by name the different types of gauges: a. plug gauge b. ring gauge c. snap gauge d. gauge blocks e. dial indicators f. optical comparator. 3. demonstrate the procedures for interpreting and recording measurement information obtained by gauging. 4. demonstrate the appropriate procedures for setting up and gauging given parts with the identified gauges.	• Teacher provides a small group demonstration or use of gauges. • Students practice use of gauges by completing problem exercises. • Teacher matches successful and interested students with those having difficulty with this task. • Para-professionals provide sustained involvement with students having difficulty with this task. • Students review and discuss illustrated transparencies.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 3,8,9	"Gauge Blocks"	12	7
NUMBERS B 2a,b, 4f	"Plug, Ring, and Snap Gauges"	12	7
APPLICATION C 3	"Dial Indicators"	12	7
PHYSICAL D 1, 2b, 3f	"Pneumatic Gauges"	12	7

COMMON CLUSTER TASKS

Code: MFG - CT16 TASK: Use and interpret gauges

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Gauge Thickness Wire Sheet metal Depth Marking Go No go Thread	Read dials and gauges, relate to its operational need. Read and record gauge according to scale. *Measurement according to some standard or system.	

Supportive Instructional Materials:

Kit of labeled instruments
Sheet explaining the basic need or use of each instrument
Standardized gauges for observation and use

COMMON CLUSTER TASKS

TASK: Operate a hardness testor

Code: MFG - CT17

Student Name: ____________

Student Progress: Introduced / Involved / Productive / Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify by name the different types of hardness testors: a. Brinell testor b. Rockwell testor. 2. select the appropriate machine and scale for testing a given specimen. 3. clean and prepare the specimen for testing. 4. follow the prescribed procedures for testing a given specimen for hardness with either a Rockwell or Brinell testing machine.	• Students test prepared samples of metals prior to and following heat treatment. • Teacher/para-professional directs a demonstration on operation of the hardness testor. • Para-professionals provide sustained involvement with students having difficulty with this task. • Teacher encourages small peer group cooperation and interaction.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 7,8,10 NUMBERS B 2a,b APPLICATION PHYSICAL D 1a,b,c,d 2b	Metalwork Technology and Practice Unit 56	13	12

COMMON CLUSTER TASKS

Code: MFG - CT17 TASK: Operate a hardness testor

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Tensile Diamond cone point Penetration Scratch Microscope Tensile strength Testers Brinell Rockwell	Relationship of materials (diamond cone), preparation (ground at 120° angle), pressed into metals with fixed weights and leverage to hardness of the weld or metal being tested. Understand the method of reading labels to determine hardness, etc.	

Supportive Instructional Materials:

COMMON CLUSTER TASKS

Sheet 1 of 1

Code: MFG - CT18

TASK: Perform basic heat treatment processes

Student Name: ____________________

Student Progress (Introduced / Involved / Productive / Employable)	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify and describe the procedures for the different heat treatment processes: a. annealing b. normalizing c. case hardening 1) pack method 2) liquid-salt 3) nitriding d. surface hardening e. tempering. 2. select and describe the equipment needed for heat treatment: a. furnace b. pyrometer c. kasenite d. tongs e. gloves f. face shield. 3. select the appropriate quench media for specific heat treatment processes: a. oil c. sand b. water d. others 4. clean and prepare metal prior to heat treatment. 5. follow the prescribed procedures in performing each of the identified heat treatment processes on prepared specimens.	• Teacher directs a small group demonstration of heat treat furnace operation. • Students heat treat prepared samples and test them for hardness. • Students review and discuss illustrated text materials. • Teacher encourages small peer group cooperation and interaction.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 5,9,10	Metalwork Technology and Practice Unit 46	13	12
NUMBERS	General Metals, p. 8	13	11
APPLICATION C 8			
PHYSICAL D 1a,b,d 2b 3c,g			

COMMON CLUSTER TASKS

Code: MFG - CT18 TASK: Perform basic heat treatment processes

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Annealing / Conduction Normalizing / Radiation Case hardening / Heating Nitriding / Quenching Surface hardening Tempering Furnace Tongs Kasenite Carburizing Critical point Preheat Concurrent heat Internal stress Connection	Relate color to temperature by studying the color, temperature chart of 0-90 point carbon steel.	• There are many temperature indicators, it is best to work with the vocational instructor so supportive help can be relative to the instructor's need.

Supportive Instructional Materials:

COMMON CLUSTER TASKS

TASK: Maintain abrasive equipment

Code: MFG - CT19

Student Name: ______________

Student Progress: Introduced	Involved	Productive	Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
				Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify by name the different types of abrasive equipment: a. oilstones b. hand grinders c. power grinders d. oilstone grinders e. abrasive wheels. 2. demonstrate the basic procedures/techniques for: a. dressing the surface of an oilstone b. selecting/ordering c. truing grinding wheels d. sharpening grinding wheels e. using diamonds on grinding wheel f. selecting grinding guards. 3. observe and demonstrate the basic safety precautions related to maintenance of abrasive equipment.	• Students maintain, sharpen, and dress abrasive tools and equipment found in the lab. • Para-professionals discuss maintenance of abrasive tools and equipment individually with students as they use them.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 2,3,7,9 NUMBERS B 2a,b APPLICATION C 3,5,6,8 PHYSICAL D 1a,b,c,d 2a,b			

COMMON CLUSTER TASKS

Code: MFG - CT19 TASK: Maintain abrasive equipment

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Surface dressing Truing Grinding guards Sharpen		• Study manuals for safety rules.

Supportive Instructional Materials:

COMMON CLUSTER TASKS

TASK: Use and interpret vernier measuring tools

Code: MFG - CT20

Student Name: ____________

Student Progress: Introduced	Involved	Productive	Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
				Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify by name the different types of vernier measuring tools: a. vernier caliper b. vernier height gauge c. vernier depth gauge d. gear tooth vernier caliper e. vernier protractor. 2. demonstrate the appropriate procedures/techniques for using the vernier caliper. 3. demonstrate the procedures/techniques for reading a vernier caliper: a. vernier alignment concept b. vernier protractors: 1) degrees 2) minutes 3) seconds. 4. properly store and care for vernier tools.	• Teacher provides a demonstration of vernier measuring tools using transparencies. • Students view film and film loops on use of vernier tools. • Students practice use of vernier measurement tools by measuring and recording the measurement of several precision components.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 3,8,9	"Vernier Caliper" (series of 8)	12	7
NUMBERS B 2a,b, 4a,5	"Verniers"	8	19
APPLICATION C 3,8	"Precision Measurement"	12	7
PHYSICAL D 1a,b,c,d,f 2b 3			

COMMON CLUSTER TASKS

Code: MFG - CT20 TASK: Use and interpret vernier measuring tools

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Vernier caliper Gauge Degree Seconds Protractor	Hand on experience in use and interpretation of scales and gauges.	

Supportive Instructional Materials:

Kit of labeled tools

COMBINATION WELDING

INSTRUCTIONAL TASK MODULES

CW01 Set up welding equipment

CW02 Select the appropriate welding process

CW03 Prepare welding materials

CW04 Perform gas welding and cutting

CW05 Perform arc welding operations

CW06 Perform resistance welding

CW07 Perform TIG and MIG welding

CW08 Perform soldering

CW09 Perform brazing

SUBCLUSTER: COMBINATION WELDING

Sheet 1 of 1

TASK: Set-up welding equipment

Code: MFG - CW01

Student Name: ____________

Student Progress: Introduced / Involved / Productive / Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:	

Behavioral Task Knowledges/Task Skills

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. describe and demonstrate the set-up of the following gas welding equipment:
   a. regulator settings
   b. hose condition
   c. torch operation
   d. cylinder tanks
   e. spark lighter
   f. fluxes
   g. torch tip cleaner
   h. protective goggles.
2. describe and demonstrate the procedures for setting up the following arc welding equipment:
   a. ground lead
   b. electrode lead
   c. amperage setting
   d. head shield
   e. electrodes
   f. welding table or bench
   g. chipping hammer
   h. wire brush
3. describe and demonstrate the procedures for setting a resistance welder for the following settings:
   a. weld time
   b. hold time
   c. off time
   d. squeeze time
4. follow the manufacturer's specifications in setting up a TIG or MIG welding unit.
5. manipulate, operate, and set-up welding jigs and clamps.

Instructional Methods

- Students re-demonstrate the procedures for setting up a given welding unit following an instructor's demonstration.
- Students label welding components with name tags to learn parts identification.
- Students review and discuss illustrated text materials and filmstrips in small groups.
- Para-professionals provide sustained involvement with students having difficulty with this task.

Task-Related Competencies

KNOWLEDGE
A 2,3,9

NUMBERS
B 2a

APPLICATION
C 6,8

PHYSICAL
D 1a,b,c,d
2d
3c,f,g

Instructional Materials

Title	Media	Bib.
Oxyacetylene Welding and Cutting Instruction Course	13	35
Modern Welding	13	9
Metalwork Technology and Practice	13	12
"The Guy Behind Your Back"	4	35
Technifax Oxyacetylene Welding 72003-100	4, 10, 12	36
"Electric Arc Welding"	10	11
"Oxyacetylene Welding and Cutting	10	11

SUBCLUSTER: COMBINATION WELDING

Code: MFG - CW01 TASK: Set-up welding equipment

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Ground cable Work cable Outlet jacks A.C. D.C. D.C.R.P. D.C.S.P. Amperage Electrodes Flash Slag Chipping hammer Splatter Current Weld Joint Fusion Base metal Bond	Understand terms to perform various procedures and operations. Develop the ability to read selection charts in preparation for selecting proper equipment and working conditions.	• Have student verbalize what he is doing in vocational class, then relay that conversation to the vocational instructor to determine student's accuracy in perceiving his task.

Supportive Instructional Materials:

SUBCLUSTER: COMBINATION WELDING

TASK: Select the appropriate welding process

Code: MFG - CW02

Sheet 1 of 1

Student Name: ____________

Student Progress: Introduced / Involved / Productive / Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. specifically identify the metals to be welded. 2. name each of the different metals which could be welded by the following processes: a. gas b. arc c. resistance d. TIG or MIG e. brazing f. soldering. 3. determine the appropriate welding process for joining two similar metals. 4. determine the appropriate welding process for joining two different metals.	• Teacher matches successful and interested students with those having difficulty. • Students review and discuss illustrated text materials. • Through discussion, the class will develop a blackboard list of appropriate welding processes for different combinations of metals. • Students view filmstrips.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 9	Metalwork Technology and Practice	13	12
NUMBERS B 2a,b, 4a,f	"Electric Arc Welding"	10	11
APPLICATION	"Oxyacetylene Welding and Cutting"	10	11
PHYSICAL			

SUBCLUSTER: COMBINATION WELDING

Code: MFG - CW02 TASK: Select the appropriate welding process

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Gas welding Arc welding Resistance welding MIG—TIG Brazing Soldering	Knowledge of knowing what each process entails and purposes. Ability to identify accurate size as indicated on a working chart. Ability to read a working chart, identifying the related information available on chart.	• Contact the vocational welding instructor and obtain a copy of the basic working charts essential to success in his area.

Supportive Instructional Materials:

SUBCLUSTER: COMBINATION WELDING

Sheet 1 of 1

TASK: Prepare welding materials

Code: MFG - CW03

Student Name: ______________

Student Progress: Introduced / Involved / Productive / Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. demonstrate the procedures for preparing materials to be welded by: a. washing b. sanding c. wire brushing d. sandblasting e. pickling. 2. prepare the edges and surfaces of the following joints and corners prior to welding: a. butt joint b. flat weld c. lag joint d. single U-joint e. single level joint f. dowel U-joint g. lap joint h. T-joint fillet i. 45° j. outside corner k. inside corner.	• Para-professionals provide sustained involvement with students having difficulty with this task. • Students practice preparing materials for welding. • Teacher provides a demonstration of joint and corner preparation procedures/techniques. • Teacher concentrates his effort with students having difficulty.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 2,7,9	Metalwork Technology and Practice Unit 43	13	12
NUMBERS B 2a,b, 4a	"Electric Arc Welding"	10	11
APPLICATION C 6	"Oxyacetylene Welding and Cutting"	10	11
PHYSICAL D 1a,b,c,d,f 2c 3c,g			

SUBCLUSTER: COMBINATION WELDING

Code: MFG - CW03 TASK: Prepare welding materials

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Washing Sanding Wire brushing Sandblasting Pickling Butt joint Lap joint Angle joint Lag joint Inside joint Outside joint	See vocational welding teacher to determine his need for supportive assistance.	• Discuss various ways for preparing metal for joining metal. • Recognize the various joints in welding. See the welding teacher for an illustrated chart showing each of the welding joints.

Supportive Instructional Materials:

SUBCLUSTER: COMBINATION WELDING

TASK: Perform gas welding and cutting

Code: MFG - CW04

Sheet 1 of 1

Student Name: ______________________

Student Progress (Introduced / Involved / Productive / Employable)	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. select the appropriate protective clothing for gas welding. 2. select and clean the appropriate torch tip for a given application. 3. open the tanks and adjust the regulators. 4. light the torch safely and consistently. 5. adjust the torch to obtain the following flames: a. neutral c. oxidixing b. carburizing d. cutting. 6. select the appropriate flame for a given application/metal. 7. demonstrate the appropriate techniques for feeding and manipulating the torch to obtain a good weld. 8. clean and inspect the weld or cut.	• Teacher provides a small group demonstration of complete gas welding and cutting procedures. • Students review and discuss illustrated text and related materials. • Students practice identified skills to develop proficiency. • Teacher encourages small peer group cooperation and interaction.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE			
A 3,5,9	Metalwork Technology and Practice Pp. 328-332	13	12
NUMBERS			
B 2a, 4a,f	Oxyacetylene Welding and Oxygen Cutting Instruction Course	13	37
APPLICATION			
C 8	Oxyacetylene Welding	13	36
PHYSICAL			
D 1a,b,c,d 2c 3c,e,f,g			

SUBCLUSTER: COMBINATION WELDING

Code: MFG - CW04 TASK: Perform gas welding and cutting

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Flame type neutral carburizing oxidizing cutting	Read working charts to determine appropriate setting of pressure and temperature gauges, selecting proper equipment etc. See vocational instructor to determine his greatest need for supportive help.	

Supportive Instructional Materials:

SUBCLUSTER: COMBINATION WELDING

TASK: Perform arc welding operations

Code: MFG - CW05

Student Name: ______

Student Progress (Introduced / Involved / Productive / Employable)	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. select the appropriate clothing and safety equipment for arc welding: a. helmet d. gloves b. leggings e. coveralls. c. apron 2. demonstrate the use of welding shop tools: a. wire brush d. clamps b. chipping hammer e. pliers/tongs. c. wedges 3. set up the circuit and polarity for arc welding a given job. 4. select the appropriate electrode by interpreting the electrode coding system. 5. demonstrate the up-down and scratch methods of starting an arc. 6. demonstrate the appropriate techniques for feeding and manipulating the electrode in arc welding. 7. clean and inspect the weld. 8. describe the characteristics of a good weld. 9. analyze the resultant bead in terms of arc length, speed, and current intensity.	• Teacher matches successful and interested students with those having difficulty. • Teacher provides a small group demonstration of complete arc welding procedures using transparencies. • Students practice arc welding skills to develop proficiency then demonstrate the operation to show that he understands the process. • Teacher makes contact with each student during the class period.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 3,9	Modern Welding	13	9
NUMBERS B 2a,b 4a,e,f	"Arc Welding" (53 overlays)	12	7
APPLICATION C 8	Metalwork Technology and Practice Pp. 333-340	13	12
PHYSICAL D 1a,b,c,d 2c 3c,e,f,g	"Basic Electric Arc Welding" (series)	9	38

SUBCLUSTER: COMBINATION WELDING

Code: MFG - CW05 TASK: Perform arc welding operations

Basic Information for Cooperative Teaching

Language of the Task		Quantitative Concepts
Welding booth	Motor generator	Type of joint
Overlap	Transformer	Size and position of weld
Ground cable	High frequency	See vocational teacher to determine his supportive need.
Electrode holder	Current lag	
Electrode	D.C.	
Flash goggles	Straight polarity	
Gloves	Negative terminal	
Helmet	Positive terminal	
Cable	Reverse polarity	
Striking an arc	Arc	
Oscillatory	Stream	
Chipping	Flow	
A.C.	Rectifier	
Stable arc	Spatter	
60-cycle current	Penetration	

Suggestions:

- Much concern should be given to the safe use of the arc welder, not only as an operator but a concern for those who are near or may be observing.
- Contact vocational instructor for help in setting up a safety study.

Supportive Instructional Materials:

SUBCLUSTER: COMBINATION WELDING

TASK: Perform resistance welding

Code: MFG - CW06

Student Name: ______________________

Student Progress (Introduced / Involved / Productive / Employable)	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. describe the basic operational principles of a resistance welder. 2. describe the various applications of resistance spot welding. 3. select the appropriate clothing and personal safety equipment for spot welding. 4. follow the manufacturer's specifications in setting and operating a given machine. 5. describe the characteristics of a good spot weld. 6. adjust the machine settings to improve the quality of a weld.	• Teacher provides a demonstration of the complete resistance welding procedure. • Students practice resistance welding skills to develop proficiency. • Teacher encourages small peer group cooperation and interaction. • Para-professionals provide sustained involvement with students having difficulty with this task.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 9	Metalwork Technology and Practice P. 341	13	12
NUMBERS	"Electric Arc Welding"	10	11
APPLICATION	"Oxyacetylene Welding and Cutting"	10	11
PHYSICAL D 1a,b,c,d,e 2b 3			

SUBCLUSTER: COMBINATION WELDING

Code: MFC - CW06 TASK: Perform resistance welding

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Cross wire Alignment Spot weld Gloves Clear tempered goggles Electrical resistance Fusion temperatures Plastic metal Molten metal	Relation of heat on metal to warpage. Show the relationship between electrical current, pressure, time and electrode contact time on two pieces of metal.	• It is essential that the supportive teacher works closely with the vocational teacher.

Supportive Instructional Materials:

SUBCLUSTER: COMBINATION WELDING

TASK: Perform TIG and MIG welding

Code: MFG - CW07

Sheet 1 of 1

Student Name: ____________

Student Progress (Introduced / Involved / Productive / Employable)	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. describe the basic principles of a TIG/MIG welding unit. 2. name the materials (metals) that can be welded with a TIG or MIG unit. 3. select the appropriate safety equipment and clothing for operating a MIG/TIG unit. 4. follow the manufacturer's specifications in setting up and operating a TIG or MIG welding unit. 5. demonstrate the appropriate procedures for feeding and manipulating the torch. 6. clean and inspect the weld. 7. adjust the welding unit or its operation to improve the quality of the weld.	• Teacher leads a small group demonstration of the complete procedures for operation of TIG or MIG welding unit. • Students practice welding procedures to develop proficiencies. • Teacher matches successful and interested students with those who are having difficulty. • Teacher encourages small peer group cooperation and interaction.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 3,9 NUMBERS B 2a,b, 4a,f APPLICATION C 4 PHYSICAL D 1a,b,c,d 2c 3c,e,f,g	"Gas Tungsten Arc Welding System"	10	7

SUBCLUSTER: COMBINATION WELDING

Code: MFG - CW07 TASK: Perform TIG and MIG welding

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
MIG (gas metal arc welding) Direct current Reverse polarity Straight polarity TIG (gas tungsten arc welding) Inert gas Base metal Tungsten electrode Ventilation	Read working charts concerning tungsten electrode sizes and current capacities for each. See vocational welding instructor for local needs.	

Supportive Instructional Materials:

SUBCLUSTER: COMBINATION WELDING

TASK: Perform soldering

Code: MFG - CW08

Student Name: ____________________

Student Progress: Introduced / Involved / Productive / Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. describe the composition of solder: a. tin b. lead. 2. light and adjust gas furnaces to heat soldering coppers. 3. tin a soldering copper following prescribed techniques. 4. clean and apply flux to the surfaces to be soldered. 5. solder sheetmetal edges and seams with a soldering copper or electric soldering copper. 6. perform sweat soldering and hand soldering. 7. clean a soldering joint after soldering.	• Teacher encourages small peer group cooperation and interaction. • Teacher provides a demonstration of complete soldering procedures and techniques. • Students practice soldering skills to develop proficiency. • Para-professionals provide sustained involvement with students having difficulty with this task.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 7,9 NUMBERS APPLICATION C 5 PHYSICAL D 1a,b,c,d 2a/b 3c,f	Metalwork Technology and Practice Unit 42 "Soldering" "Soldering"	13 10 8	12 11 34

SUBCLUSTER: COMBINATION WELDING

Code: MFG - CW08 TASK: Perform soldering

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Soldering copper Flux Sal ammoniac Solder Solder content Sweating Soldering furnace Resin core Soldering paste Tinning Half & half Corrosive	Read charts describing flow temperatures of alloys of tin and lead. Read tables of common tin-lead solders. Familiar with use of temperatures under 800°F	• Discuss various uses of soldering. • Have a resource person demonstrate some uses.

Supportive Instructional Materials:

SUBCLUSTER: COMBINATION WELDING

TASK: Perform brazing

Code: MFG- CW09

Sheet 1 of 1

Student Name: ______________________

Student Progress (Introduced / Involved / Productive / Employable)	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. describe the various applications or uses of brazing. 2. select the appropriate rods for brazing and bronze welding. 3. demonstrate the procedures and techniques for brazing and bronze welding.	• Students practice brazing skills to develop proficiency. • Teacher provides a small group demonstration of complete brazing procedures. • Teacher concentrates his effort with students having difficulty. • Para-professionals provide sustained involvement with students having difficulty with this task. • Students review and discuss illustrated text information.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 7,9 NUMBERS APPLICATION C 5 PHYSICAL D 1a,b 2c 3c	Metalwork Technology and Practice Unit 42	13	12

SUBCLUSTER: COMBINATION WELDING

Code: MFG - CW09 TASK: Perform brazing

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Brazing Adhesion Welding Electrode Brazing rod Dissimilar metals Groove Fillet Plug Slot Non ferrous Filler metal	Read temperature scale 800°F upwards to 1200°F. Ability to read a table or chart. Check with vocational welding teacher to determine temperature readings that are essential to local teaching needs.	

Supportive Instructional Materials:

MACHINE
TOOL
PROCESSES

INSTRUCTIONAL TASK MODULES

MT01 Operate a cut off saw

MT02 Operate a pedestal grinder

MT03 Operate a shaper

MT04 Operate a milling machine

MT05 Operate a machine lathe

MT06 Operate a drill press

MT07 Operate a surface grinder

MT08 Use sheet metal handtools

MT09 Operate sheet metal machines

MT10 Perform general machine maintenance

MT11 Lubricate machinery and equipment

SUBCLUSTER: MACHINE TOOL PROCESSES

TASK: Operate a cut off saw

Code: MFG - MT01

Student Name: ____________________

Student Progress				Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced	Involved	Productive	Employable		
				Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. demonstrate the procedures for work set-up of cutoff saw: a. support stand b. adjustable vise. 2. describe the basic types of cutoff saws: a. horizontal b. vertical c. reciprocating 3. perform the following cutoff operations: a. cut bar stock b. cut sheet stock. 4. observe specific safety precautions for cutoff saw operation.	• Teacher provides a demonstration of cutoff saw operating procedures to a small group of students. • Students review illustrated text materials and view film. • Para-professionals provide sustained involvement with students having difficulty with this task.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 3,7,9	General Metals, page 2	13	11
NUMBERS B 2a,b 4a, 5	Machine Tool Metalworking, page 4	13	11
APPLICATION C 3	Modern Metalworking, page 6	13	9
PHYSICAL D 1, 2a,b	"Straight Sawing"	8	16

SUBCLUSTER: MACHINE TOOL PROCESSES

Code: MFG - MT01 TASK: Operate a cut off saw

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Cut off Support stand Adjustable vise Horizontal Vertical Reciprocating Bar stock Sheet stock	Recognize and distinguish between horizontal and vertical.	• Discuss and stress safety related to operation of the cut off saw. See the Metals instructor for specifics.

Supportive Instructional Materials:

SUBCLUSTER: MACHINE TOOL PROCESSES

TASK: Operate a pedestal grinder

Code: MFG - MT02

Student Name: ____________

Student Progress (Introduced / Involved / Productive / Employable)	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. demonstrate the procedures for set-up of a pedestal grinder. 2. describe the basic types of pedestal grinders: a. dry type b. wet type. 3. perform the following pedestal grinder operations: a. tool and cutter grinding b. form grinding c. internal grinding d. centerless grinding e. cylindrical grinding f. precision grinding g. snag grinding. 4. observe specific safety precautions for pedestal grinders.	• Teacher provides a demonstration of pedestal grinder operation using transparencies. • Students view film loop and film on grinder operation. • Teacher encourages small peer group cooperation and interaction. • Teacher concentrates his effort with students having difficulty.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 3,7,9	"Using Drill Presses and Grinders"	9	6
NUMBERS B 4a	"TG-3 Grinder"	8	7
APPLICATION C 5,8	"Grinder"	12	7
PHYSICAL D 1a,b,c,d,e,f 2a			

SUBCLUSTER: MACHINE TOOL PROCESSES

Code: MFG - MT02 TASK: Operate a pedestal grinder

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Grinding Grinding wheel(s) Arbor Wheel dressing tool	Measure and determine the arbor size of a pedestal grinder, i.e. 1 1/4". Measure and determine the diameter, face, and grit dimensions of a grinding wheel: i.e. Diameter 12" Face 2" Bore 1 1/4" Grit 30	• Ask Metals instructor for a supply catalog for further information.

Supportive Instructional Materials:

SUBCLUSTER: MACHINE TOOL PROCESSES

TASK: Operate a shaper

Code: MFG - MT03

Sheet 1 of 1

Student Name. ____________________

Student Progress (Introduced / Involved / Productive / Employable)	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. demonstrate the procedures for work set-up of shaper 2. describe the basic types of shapers: a. horizontal 1) push-cut 2) pull-cut b. vertical 1) regular 2) slotters c. special. 3. perform the following shaper operations: a. facing b. slotting c. rough finishing d. face knurling. 4. observe specific safety precautions for shaper operation.	• Teacher encourages small peer group cooperation and interaction. • Teacher or para-professional directs a demonstration of complete shaper operating procedures. • Students view the series of film loops on shaper operation. • Teacher matches successful students who are interested in helping those having difficulty.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 3,7,9 NUMBERS B 2a,b, 4a, 5 APPLICATION C 3 PHYSICAL D 1, 2a,b	"The Shaper" (series of six)	9	7

SUBCLUSTER: MACHINE TOOL PROCESSES

Code: MFG - MT03 TASK: Operate a shaper

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Shaper Ram Table Cross rail Vise Feed Horizontal travel Vertical travel Cross feed Cutting speed	Determine the number of strokes/minute of a shaper. Recognize shaper cutting speeds: 0-120 feet/minute	

Supportive Instructional Materials:

SUBCLUSTER: MACHINE TOOL PROCESSES

TASK: Operate a milling machine

Code: MFG - MT04

Sheet 1 of 1

Student Name: ______________________

Student Progress (Introduced / Involved / Productive / Employable)	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. demonstrate the procedures for set up of basic types of milling machines: a. horizontal milling b. vertical milling. 2. perform the following milling machine operations: a. face milling b. peripheral milling c. slitting saw d. slot milling e. gear cutter. 3. observe specific safety precautions for milling machines.	• Mill operator from local industry visits class and provides a demonstration of the complete milling machine operating procedures. • Para-professionals provide sustained involvement with students having difficulty with this task. • Students view films and film loop on milling machine operation. • Teacher makes contact with each student during the class period.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 3,7,9	"Milling Machine"	8	7
NUMBERS B 2a,b, 4a, 5	"The Milling Machine" (series of 4)	9	7
APPLICATION C 3	"Milling Machine"	8	20
PHYSICAL D 1, 2a,b			

SUBCLUSTER: MACHINE TOOL PROCESSES

Code: MFG - MT04 TASK: Operate a milling machine

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
End milling Face milling Vertical mill Horizontal mill Slitting saw Slot milling Feat cutter Quill Longitudinal travel Cross travel Vertical travel	Measure and select mill end cutters: 3/16" diameter 3/8" diameter 1/2" diameter 1" diameter Determine size of mill vise opening. Recognize and interpret spindle speeds in revolutions per minute: 60-1750 rpm.	

Supportive Instructional Materials:

SUBCLUSTER: MACHINE TOOL PROCESSES

TASK: Operate a machine lathe

Code: MFG - MT05

Sheet 1 of 1

Student Name: ____________

Student Progress	Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. describe and demonstrate the procedures for set-up of a machine lathe. 2. describe the basic types of machine lathes: a. bench lathe b. toolroom lathe c. pedestal lathe d. turrent lathe. 3. perform the following lathe operations: a. turning between centers b. drilling c. knurling d. facing e. threading. 4. observe specific safety precautions for machine lathe.	• Students view film loop series on lathe operation. • Teacher concentrates his effort with students having difficulty. • Teacher provides a small group demonstration of the complete lathe operating procedures. • Para-professionals provide sustained involvement with students having difficulty with this task.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE	Machine Shop Wall Charts	16	5
A 3,6,7,9	"The Engine Lathe" (series of 8)	9	18
NUMBERS	"Metalworking Lathe" (series of 8)	9	7
B 2a,b, 4a, 5	Manual of Lathe Operation		
APPLICATION			
C 3	"Lathe"	12	9
PHYSICAL	"Lathe, The Metal"	8	20
D 1 (in total 2a/b			

SUBCLUSTER: MACHINE TOOL PROCESSES

Code: MFG - MT05 TASK: Operate a machine lathe

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Speed Feed log Swing Headstock Live center Dead center Face plate 3-jaw chuck Carriage Saddle Apron Compound rest Cross slide Feed rod Tailstock Tool bits Facing Center drill Side rake Side relief Hand wheel	Use a micrometer to measure the diameters of the round stock being machined in the lathe. Read interpret the micrometer to within .001". Recognize and interpret: 1.000" .100" .010" .001"	• Obtain a drawing or picture of a machine lathe which identifies the part names.

Supportive Instructional Materials:

SUBCLUSTER: MACHINE TOOL PROCESSES

Sheet 1 of 1

TASK: Operate a drill press

Code: MFG - MT06

Student Name: ____________

Student Progress: Introduced / Involved / Productive / Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. describe and demonstrate the procedures for set up of drill press. 2. describe the basic types of drill presses: a. high speed sensitive b. deep hole drilling machine c. radial drill press d. multi-spindle e. gang drills. 3. perform the following drill press operations: a. drilling b. reaming c. countersink d. counter bore e. wiggler location. 4. observe specific safety precautions for drill press operations.	• Teacher or para-professionals provide a demonstration of the complete procedures involved in drill press operation. • Teacher makes contact with each student during the class period. • Students view films/film loops. • Teacher matches successful and interested students with those who are having difficulty.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 3,7,9	"Drill Press Series" (series of 10)	9	7
NUMBERS B 2a,b, 4a, 5	"Drilling, Threading, and Tapping"	10	16
	"Drill Press"	8	7
APPLICATION C 3	"The Drill Press"	8	20
PHYSICAL D 1, 2a,b			

SUBCLUSTER: MACHINE TOOL PROCESSES

Code: MFG - MT06 TASK: Operate a drill press

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Drilling Reaming Countersinking Counterboring Quill Stroke Diameter Spindle speeds Manual feed Power feed Threading	Measure drill press vise openings: 1"-8". Determine the size (diameter) of drill to be used in different drill press operations.	• Discuss and stress the importance of safety in drill press operation.

Supportive Instructional Materials:

SUBCLUSTER: MACHINE TOOL PROCESSES

TASK: Operate a surface grinder

Code: MFG - MI07

Student Name: ____________

Student Progress (Introduced / Involved / Productive / Employable)	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify the procedures/equipment for set-up of surface grinder. 2. basic types of surface grinders: a. planer type b. rotary type c. manually operated. 3. skill in performing surface grinder operations: a. surface planer b. surface roughness c. super finishing. 4. safety precuations for surface grinder operations.	• Teacher directs a small group demonstration of the procedures for operation of a surface grinder. • Students view film loop/filmstrip on surface grinder operation. • Para-professionals provide sustained involvement with students having difficulty with this task. • Teacher makes contact with <u>each</u> student during the class period.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A3,7,9 NUMBERS B 2a,b, 4a, 5 APPLICATION C 3 PHYSICAL D 1, 2a,b	"TG-3 Grinder" "Tool Grinder"	8 10	7 20

SUBCLUSTER: MACHINE TOOL PROCESSES

Code: MFG - MT07 TASK: Operate a surface grinder

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Grinding wheel Dresser diamond Magnetic table (chuck) Automatic feed Manual feed Transverse (cross feed) Longitudinal Vertical height capacity	Recognize common sizes and grits of grinding wheels: Sizes: 7" diameter 1/2" wide 1 1/4" hole Grit: fine Approximate speed of grinding wheel: 3000 revolutions per minute (rpm)	

Supportive Instructional Materials:

SUBCLUSTER: MACHINE TOOL PROCESSES

TASK: Use sheet metal handtools

Code: MFG - MT08

Sheet ___ of ___

Student Name: ______________

Student Progress	Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify by name and describe the use of the following sheet metal handtools: a. combination snips b. circular snips c. aviation snips d. hawk-billed snips e. hollow punch f. solid punch g. power shears h. sheet metal gauge i. cast iron stakes j. hollow mandrel k. beakhorn stakes l. round head stakes m. conductor's stake n. hand seamer o. hand groover p. pop rivet gun 2. use the identified hand tools to perform the following sheet metal operations: a. cutting sheet metal b. forming seams c. circular cutting d. forming & bending e. assembling joints: 1) lap seam 2) countersunk lap seam 3) standing seam 4) insert bottom seam f. setting rivets. 3. observe specific safety precautions for sheet metal handtools.	• Students view film loops and filmstrip/record. • Students prepare samples of the identified sheet metal operations, demonstrating the use of selected sheet metal handtools. • Para-professionals provide sustained involvement with students having difficulty with this task.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 9	"Working with Sheetmetal" (series of 10)	9	18
NUMBERS B 4a	"Metalworking"	5	16
APPLICATION C 5	"Snips and Shears"	8	20
PHYSICAL D 1a,b,c,d	"Bench and Sheet Metal"	10	11

SUBCLUSTER: MACHINE TOOL PROCESSES

Code: MFG - MT08 TASK: Use sheet metal handtools

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Snips combination circulor aviation Pop rivet gun Punch hollow solid Hand seamer Hand groover Stakes beakhorn round head conductor's	Be able to measure in inches and fractional parts of an inch.	• Assist students in working on names of tools and parts of tools by reviewing illustrated (labeled) pictures or drawings.

Supportive Instructional Materials:

SUBCLUSTER: MACHINE TOOL PROCESSES

Sheet 1 of 1

TASK: Operate sheet metal machines

Code: MFG - MT09

Student Name: ____________________

Student Progress	Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify by name and describe the operation of selected sheet metal machines: a. power notcher b. coper c. angle shear d. foot shears e. ring and circular shears f. bar folder g. cornice brake h. box and pan brake i. slip roll forming machine j. combination rotary machine. 2. operate the identified machines to perform the following sheet metal machines operations: a. crimping b. roll edges c. beading d. burr turning e. wiring an edge f. metal folding g. hemmed edge h. notching i. bending j. setting rivets	• Students view film loops and filmstrip/record. • Students prepare samples of the identified sheet metal operations, demonstrating the use of each machine. • Para-professionals provide sustained involvement with students having difficulty with this task. • Teacher matches successful and interested students with those having difficulty with this task.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 3,7,9	"Working with Sheetmetal" (series of 10)	9	18
NUMBERS B 2a,b a,5	"Metalworking"	5	16
APPLICATION C 6,8	"Bench and Sheet Metal"	10	11
PHYSICAL D 1a,b,c,d,e 2b, 3c			

SUBCLUSTER: MACHINE TOOL PROCESSES

Code: MFG - MT09 TASK: Operate sheet metal machines

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Bar folder Cornice brake Box and pan brake Slip roll forming machine Combination rotary machine	Be able to measure fractional parts of an inch, feet, unless vocational teacher is using metric measurements. Determine with the vocational teacher the essentials of measuring.	• Stress safety factors related to the operation of sheetmetal machines. See the Metals instructor for safety specifics. • Review the names and parts of the sheet metal machines by referring to illustrated pictures or drawing of each of the machines which have the parts correctly labelled.

Supportive Instructional Materials:

SUBCLUSTER: MACHINE TOOL PROCESSES

Sheet 1 of 1

TASK: Perform general machine maintenance

Code: MFG - MT10

Student Name: ______________

Student Progress (Introduced / Involved / Productive / Employable)	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. perform the following job skills related to general machine maintenance: a. clean and grease handtools. b. clean machines. c. clean with compressed air. d. clean by partial disassembly. e. clean by complete disassembly. f. maintain V-belts. g. replace bearings: 1) split bearings 2) ring oiler bearings 3) ball and roller bearings. h. replace sleeve bearings. i. replace ball bearings: 1) removing 2) installing.	• Students perform the identified job skill relating to the general maintenance of machinery and equipment in the lab. • Teacher provides a demonstration of each identified job skill as part of the lab machine maintenance schedule. • Teacher matches successful and interested students with those who are having difficulty.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 2,3,7,9 NUMBERS B 2a,4a,5 APPLICATION C 3,6,8 PHYSICAL D 1a,b,c,d 2b 3c,e,f,g	"Power Tool Maintenance"	12	7

SUBCLUSTER: MACHINE TOOL PROCESSES

Code: MFG - MT10 TASK: Perform general machine maintenance

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Grease Compressed air V-belts Bearings split ring ball roller sleeve	Measure exact size of V-belts to be replaced on specific machines.	• Contact vocational manufacturing instructor to determine how to best support his vocational program.

Supportive Instructional Materials:

SUBCLUSTER: MACHINE TOOL PROCESSES

Sheet 1 of 2

TASK: Lubricate machinery and equipment

Code: MFG - MT11

Student Name: ____________

Student Progress: Introduced / Involved / Productive / Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify the basic types of lubrication oils: a. vegetable and animal fats and oils. b. petroleum oils. c. mineral lubricants. 2. identify the basic types of industrial greases: a. lime-based. b. sodium-based. c. aluminum-based. d. mixed-base. 3. describe the purpose of greasing equipment: a. prevent metal-on-metal contact. b. reduce friction, increase efficiency. c. provide constant lubrication. d. protect surface from corrosion. e. prevent entrance of abrasive materials. f. cushion load shocks. g. provide for idssipation of heat. 4. identify and operate oiling equipment: a. storage cans. b. hand oilers. c. oil cups. 5. identify components of and operate greasing systems:	• Students perform the identified skills on the shop equipment in need of lubrication. • Students review equipment lubrication and service manuals for shop equipment. • Teacher provides a demonstration of the identified lubrication processes. • Teacher encourages small peer group cooperation and interaction.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 2,3,7,9 NUMBERS B 2a,c 4a, 5 APPLICATION C 3,6,8 PHYSICAL D 1a,b,c,d 2b 3c,e,f,g	Equipment lubrication/operating manuals	14	

SUBCLUSTER: MACHINE TOOL PROCESSES

Code: MFG - MT11 TASK: Lubricate machinery and equipment

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Hand oilers Grease cups Oil cups Grease fittings Zerk	Recognize weights of oils and greases by interpreting label information.	

Supportive Instructional Materials:

SUBCLUSTER: MACHINE TOOL PROCESSES

TASK: Lubricate machinery and equipment

Sheet 2 of 2

Code: MFG - MT11

Student Name: ____________

Student Progress: Introduced	Involved	Productive	Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
				Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: a. hand operated cups. b. hand pressured grease guns. c. pressure greasing equipment. 6. demonstrate the following procedures for lubricating ball bearings: a. using oil. b. greasing bearings. c. lifetime bearings. d. high-speed bearings. 7. demonstrate the following procedures for lubricating motor bearings: a. sleeve bearings and wick oilers. b. sleeve bearings with ring oilers. c. ball bearings with oil cups. d. ball bearings with pressure grease fittings.	

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE			
NUMBERS			
APPLICATION			
PHYSICAL			

SUBCLUSTER:

Code: ___ - ____ TASK:

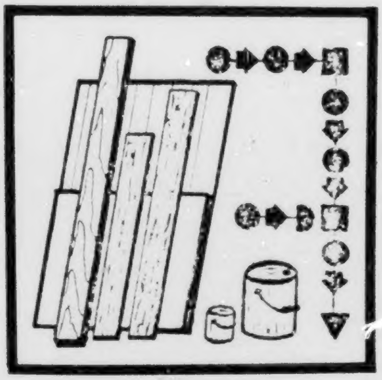
Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	

Supportive Instructional Materials:

SOFT

MATERIAL

PROCESSES



INSTRUCTIONAL TASK MODULES

SM01 Identify different wood materials

SM02 Use measurement and layout tools

SM03 Cut stock with handsaw

SM04 Cut stock with portable power saws

SM05 Use planing, smoothing, and shaping hand tools

SM06 Use drilling and boring tools

SM07 Use fastening and disassembly tools

SM08 Operate power hand tools

SM09 Maintain hand and power tools

SM10 Utilize linear, square, and cubic measures of materials

SM11 Operate power sanders

SM12 Operate power routers

SM13 Operate a drill press

SM14 Operate a jig saw

SM15 Operate a surface planer

SM16 Operate a jointer

SM17 Operate a circular saw

SM18 Operate a band saw

SM19 Operate a wood lathe

SM20 Operate a wood shaper

SM21 Employ wood fasteners

SM22 Apply selected wood finishes

SUBCLUSTER: SOFT MATERIAL PROCESSES

TASK: Identify different wood materials

Code: MFG - SM01

Sheet 1 of 1

Student Name: ______________________

Student Progress: Introduced / Involved / Productive / Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify the general types of woods and wood materials: a. hardwoods b. dimension lumber c. plywoods d. sheet materials. 2. visually identify types of hardwoods such as: a. basswood b. pine c. oak d. walnut e. cherry f. maple g. pecan h. mahogany i. ash. 3. visually identify the different plywood materials: a. A-A, A-C, C-D, etc. b. thicknesses 1/4 to 5/4 c. interior - exterior d. decorative veneers. 4. visually identify different sheet materials other than plywood: a. masonite b. flake board c. particle board.	• Students cut, collect, display, and label samples of all the different wood materials. • Para-professionals provide sustained involvement with students having difficulty with this task. • Teacher encourages small peer group cooperation and interaction. • Students review and study wood grain pictures from any general woodworking text.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 1,9 NUMBERS APPLICATION C 2 PHYSICAL			

SUBCLUSTER: SOFT MATERIAL PROCESSES

Code: MFG - SM01 TASK: Identify different wood materials

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Exterior Interior Veneer Knot Plywood Hardboard Finished S2S (surfaced 2 sides) S4S (surfaced 4 sides) Grain Hardwood Softwood AD (Air dried) KD (Kiln dried)	Recognize standard sizes of solid wood (i.e. 1x4, 1x6, 1x8, 1x10, 1x12, 2x4, 2x6, 2x8, 2x10, 2x12). Recognize standard lengths of lumber (i.e. 6', 8', 10', 12', 14', 16'). Check with vocational instructor to determine appropriateness of figuring board feet. Recognize standard sheet sizes (i.e. 4x7, 4x8, 4x10, etc.). Recognize standard sheet size thicknesses (i.e. 1/4", 3/8", 1/2", 5/8", 3/4", 1", etc.).	• Students could go on a field trip to a lumber company. • Students could take a field trip to a construction sight.

Supportive Instructional Materials:

Modern Woodworking by Goodhart-Willcox
Pieces of lumber with defects
Different grades of plywood
Wood samples

SUBCLUSTER: SOFT MATERIAL PROCESSES

TASK: Use measurement and layout tools

Code: MFG - SM02

Sheet 1 of 1

Student Name: ______________

Student Progress (Introduced / Involved / Productive / Employable)	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify by name specific layout/ measuring tools: a. level b. tape or rule c. framing square d. T bevel e. scratch awl f. steel long tape g. chalk line h. line level i. combination square j. marking gauge k. plumb bob l. dividers m. butt gauge. 2. recognize and observe safety precautions in using layout and measuring tools. 3. interpret measuring tools accurately. 4. properly store specific layout and measuring tools. 5. demonstrate the different applications or uses of each tool.	• Students view film as an introduction and review of concept. • Students view film loops and illustrative charts. • Teacher demonstrates the use of the identified tools with individual students on specific jobs. Students return the demonstration. Note: This task will be performed as a part of several succeeding tasks.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 1,9	Modern Carpentry, pp. 8-22	13	9
NUMBERS B 2a,4a,i,5	"Carpentry Part I - Measuring, Marking, and Leveling Tools"	8	23
	"Layout Using Marking Gauge"	9	11
APPLICATION C 5,7	"How to Use Measuring Tools"	9	24
PHYSICAL D 1a-d, 2a/b, 3	Stanley charts	16	25

SUBCLUSTER: SOFT MATERIAL PROCESSES

Code: MFG - SM02 TASK: Use measurement and layout tools

Basic Information for Cooperative Teaching

Language of the Task

Level	Inches
Tape or rule	Scale (1/4" = 1')
Framing square	
T bevel	
Scratch awl	
Steel long tape	
Chalk line	
Line bevel	
Combination square	
Marking gauge	
Plumb bob	
Dividers	
Butt gauge	
Feet	

Quantitative Concepts

Measure boards for thickness, width and length. Lengths is in feet, width is in feet or inches, thickness is in inches.

The concept of rounding may be applied by rounding the actual measurement up to: even numbers of feet in length, i.e. 6', 8', 10'; even numbers of inches in width i.e. 4", 6", 8"; full numbers of inches in thickness i.e. 1", 2", 3".

Prepare a shopping list for tools. Find these items in a catalogue, identify and price, figure total cost.

Suggestions:

- Teacher picks up a tool - student identify.
- Student picks up tools one at a time and identify.
- Student identify which tool another student is using in pantomine.
  - by description of tool.
  - by name.
- Student match name and tool by
  - printed label
  - verbal identification
- Teacher and deaf student should cooperatively develop some simple signs related to language of the task.
- Informally encourage voluntary buddy system for assisting deaf students (individualize without calling attention to the individual).
- Be careful in using words with multiple meanings when talking to lip reading deaf students (plumb, scale).

Supportive Instructional Materials:

Assortment of measuring tools supplied by the vocational teacher.

SUBCLUSTER: SOFT MATERIAL PROCESSES

TASK: Cut stock with hand saws

Code: MFG - SM03

Student Name: ____________

Student Progress: Introduced / Involved / Productive / Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify by name and describe the appropriate application/use of the following hand saws: a. crosscut b. ripsaw c. compass d. backsaw e. coping f. miter box g. veneer saw. 2. demonstrate the following procedures in cutting wood materials with hand saws: a. crosscutting b. ripping c. cutting kerfs d. finishing a cut e. cutting irregular shapes. 3. observe specific safety precautions for working with hand saws.	• Students develop the specific skills for the task by repetitive practice. • Teacher provides a small group demonstration of hand saw uses. • Teacher matches successful and interested students with students having difficulty.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 1,9	Woodworking Technology Topic 42	13	12
NUMBERS	"Industrial Arts for the Educationally Handicapped"	13	33
APPLICATION C 2,5			
PHYSICAL D 1a,b 2c 3f,g			

SUBCLUSTER: SOFT MATERIAL PROCESSES

Code: MFG - SM03 TASK: Cut stock with hand saws

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Crosscut saw Ripsaw Backsaw Coping saw Miter Kerf Teeth Grain Squareness Set Joint Guide	Estimate the angle that the saw makes with the stock while cutting. Discuss the 8 point 10 point concept as the number (8 or 10) teeth a saw has per inch.	• Students view wall chart by Disston on types of hand saw. • Have students count the number of teeth per inch in several different saws.

Supportive Instructional Materials:

Wall chart by Disston

Labeled pictorial drawings of special purpose hand saws

SUBCLUSTER: SOFT MATERIAL PROCESSES

TASK: Cut stock with portable power saws

Code: MFG - SM04

Student Name: ____________

Student Progress: Introduced / Involved / Productive / Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify by name and describe the application/use of the following portable power saws: a. saber saw b. hand circular saw (skil saw) c. others. 2. measure and mark materials to be cut with a pencil and appropriate tools, i.e. square, tramel points, compass. 3. demonstrate the operation of each of the identified power saws in cutting wood materials. 4. observe specific safety precautions related to the operation of power saws.	• Students develop the specific skills by repetitive practice. • Teacher demonstrates proper use of portable power saws. • Students read, review, and discuss text information. • Teacher matches successful and interested students with those having difficulty.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 1,9 NUMBERS APPLICATION C 5 PHYSICAL D 1a,b 2c 3c,f,g	<u>Woodworking Technology</u> Topic 53	13	12

SUBCLUSTER: SOFT MATERIAL PROCESSES

Code: MFG - SM04 TASK: Cut stock with portable power saws

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Saber Attachments Blades Portable Circular (skil) Power	Recognize various diameters as they relate to circular saw sizes (i.e. 6", 6 1/2", 7"). Recognize common saber saw sizes in length and in width. Practice measuring in inches and fractions of an inch as related to measuring and marking material for cutting.	• Have each student handle and discuss the different types of blades available for each saw. (Possibly a trip to a hardware store. • Emphasize the need for wearing safety glasses and using the saws carefully and safely.

Supportive Instructional Materials:

Collect blades (new, used, or damaged) from the vocational instructor or a hardware store.

SUBCLUSTER: SOFT MATERIAL PROCESSES

Sheet 1 of 1

TASK: Use smoothing, planing, and shaping hand tools

Code: MFG - SM05

Student Name: ____________

Student Progress: Introduced / Involved / Productive / Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify by name specific types of planing, smoothing, and shaping hand tools: a. jack plant b. block plane c. utility knife d. scraper e. surform plane f. router plane g. wood chisels h. putty knife i. flooring chisel j. cabinet maker's plant. 2. recognize and observe specific safety precautions for using planing, smoothing, and shaping tools. 3. select and demonstrate the appropriate tool for a given application or operation. 4. identify, describe, and simulate the proper storage conditions for specific smoothing, planing, and shaping tools.	• Students view film loops on use and sharpening of tools. • Students review illustrated text for nomenclature. • Teacher provides demonstration on use and maintenance of each tool for each individual student as he begins to use selected tools. • Para-professionals provide sustained involvement with students having difficulty with this task. Note: This task will be performed as a part of several succeeding tasks.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 3	Modern Carpentry, pp. 12-13	13	9
NUMBERS	"Planes and Their Uses"	9	26
	"Sharpening the Plane"	9	24
APPLICATION C 2,5,8	"Woodworking-Part I" 8 loops	9	18
PHYSICAL			

SUBCLUSTER: SOFT MATERIAL PROCESSES

Code: MFG - SM05 TASK: Use smoothing, planing, and shaping hand tools

Basic Information for Cooperative Teaching

Language of the Task

Smooth plane	Level
Jack plane	Flush
Block plane	File handle
Surformer	Tool box or kit
Rasp	Oil stone
File shapes half-round square rat-tail triangle	Grinding wheel
	Wire brush
Utility knife	
Scraper	
Router	
Chisel wood cold bride brick	
Smooth	

Quantitative Concepts

The following are common tool sizes which the student should know:
- planes 6" - 14" (length of bed)
- files (length of blade)
- rasp/surformer 6" - 12" (length of blade)

Determine the size of a given tool by measuring the appropriate part of the tool.

Suggestions:

- Stess safety and care in handling tools (i.e. storage of tools).
- Teacher and deaf student should cooperatively develop some simple signs related to language of the task.
- Speak distinctly and slowly, use simple sentences, and look directly at lip reading deaf students.
- Be careful in using words with multiple meanings when talking to lip reading deaf students (plane, jack, rat tail).

Supportive Instructional Materials:

Catalogue from Sears, etc., for tool identification
Industrial catalogue to learn industrial name brands

SUBCLUSTER: SOFT MATERIAL PROCESSES

TASK: Use drilling and boring tools

Code: MFG - SM06

Student Name: ____________

Student Progress: Introduced	Involved	Productive	Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
				Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify by name specific drilling and boring tools: a. hand drill b. push drill c. brace d. countersink e. expansive bit f. auger bits (1/4 to 1") g. twist drill bits. 2. recognize and observe specific safety precautions related to using drilling and doring hand tools. 3. select and demonstrate the appropriate tool for a given application or operation. 4. identify, describe, and simulate the proper storage conditions for given drilling and boring hand tools.	• Students prepare a display of tools with tool parts labeled. • Students view film loops. • Teacher encourages small peer group cooperation and interaction. • Teacher provides a demonstration of specific tools for individual jobs with each student. Note: This task will be performed as a part of several succeeding tasks.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 3,4	Modern Carpentry, pp. 14-15	13	9
NUMBERS	"Portable Drills"	12	7
B 1, 4a	"Power Drills for Woodworking"	9	20
APPLICATION	"How to Use Hand Boring Tools"	9	84
C 2,5,8			
PHYSICAL D 1a,d 2b 3c,e,f,g			

SUBCLUSTER: SOFT MATERIAL PROCESSES

Code: MFG - SM06 TASK: Use drilling and boring tools

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Auger bits Standard bits Tang or shank Twist Drills Brace Countersink	Measure the diameter of drilled hole. Recognize size of standard bits. Using drilling tools, measure the diameter in fractional parts of an inch to a 1/16th of an inch accuracy.	• Drill several holes with different size bits. Measure the diameters of the holes and explain the relationship between the 24 stamped on the shank and the 1 1/2" diameter of the hole drilled by the bit. (Size stamped on shank is a whole number which indicates the size of the diameter in 16ths of an inch) • Use pieces of cardboard 1/16" long to construct the size of the diameter. • Teacher and deaf student should cooperatively develop some simple signs related to language of the task. • Informally encourage voluntary buddy system for assisting deaf students (individualize without calling attention to the individual).

Supportive Instructional Materials:

Several sizes of auger bits
Board with holes drilled by specified bits
Ruler with divisions of an inch down to 16ths
Pieces of paper 1/16" in width

SUBCLUSTER: SOFT MATERIAL PROCESSES

Sheet 1 of 1

TASK: Use fastening and disassembly tools

Code: MFG - SM07

Student Name: ____________

Student Progress (Introduced / Involved / Productive / Employable)	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will : 1. identify by name specific fastening and disassembly tools: a. ripping bar b. rip chisel c. curved claw hammer d. rip claw hammer e. half hatchet f. soft face hammer g. adjustable wrench h. screw drivers i. nail sets j. screw driver bits k. pliers l. ratchet screwdriver m. Phillip' screwdriver. 2. recognize and observe specific safety precautions in using fastening and disassembly tools. 3. select and demonstrate the appropriate tool for a given application. 4. identify, describe, and demonstrate the the proper storage condition for given fastening and disassembly tools.	• Students review texts for illustrative materials, diagrams, and pictures. • Teacher provides demonstration of each tool for specific jobs with individual students. Students return the demonstration. • Teacher matches successful students who are interested in helping those having difficulty. Note: This task will be performed as a part of several suceeding tasks.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 3,4	Modern Carpentry, pp. 16,17,19	13	9
NUMBERS	Carpentry and Builder's Guide Volume I	13	27
APPLICATION C 2,5,8			
PHYSICAL D 1a,d,f 2b 3c,e,f,g			

SUBCLUSTER: SOFT MATERIAL PROCESSES

Code: MFG - SM07 TASK: Use fastening and disassembly tools

Basic Information for Cooperative Teaching

Language of the Task	Quantitative Concepts
Claw hammer	Recognize hammer sizes in ounce measurements.
Ripping bars	Recognize screwdriver sizes in inch measurements.
Nail set	Recognize nail set sizes in diameters of the tip.
Screw driver	

Suggestions:

- Compare the weight of an 8 oz. hammer to that of a 18 oz. hammer (lift, pendulum swing, balance).
- Measure the length of various size ripping bars.
- Explain that nail sets are sized by the diameter measurement of the tip (measurement is in 32nd of an inch).
- Measure the size of several different screw drivers (length from ferrule to the tip).
- Speak distinctly and slowly, use simple sentences, and look directly at lip reading deaf students.

Supportive Instructional Materials:

Several claw hammers of different size.
Several ripping bars of varying length.
Nail sets of varying size.
Several screw drivers of different size.

SUBCLUSTER: SOFT MATERIAL PROCESSES

TASK: Operate power hand tools

Code: MFG - SM08

Student Name: ______________

Student Progress: Introduced / Involved / Productive / Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify by name specific hand power tools: a. portable circular saw (skil) b. saber saw c. portable electric drill d. power plane e. router f. portable sanders. 2. recognize and observe specific safety precautions in operating power hand tools. 3. select and demonstrate the appropriate power tool for a given application. 4. identify, describe, and demonstrate the proper storage condition for specific power hand tools.	• Teacher conducts vocabulary exercise on identification of tool parts with flash cards and mock-ups. • Students view film loop series. • Teacher provides demonstration of the safe use of power hand tools with individual students. • Teacher concentrates his effort with students having difficulty. • Students review illustrated text materials. Note: This task will be performed as a part of several succeeding tasks.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 3,4,7,9	Modern Carpentry, Chapter 2 pp. 25	13	9
NUMBERS B 4a	"Power Tools" (series)	12	28
APPLICATION C 5,8	"Power Tools" (series)	9	29
PHYSICAL D 1a,b,d 2b 3c,g	"ABC's of Handtools"	13	30

SUBCLUSTER: SOFT MATERIAL PROCESSES

Code: MFG - SM08 TASK: Operate power hand tools

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Portable drill press Portable circular saw (skil saw) Portable saber saw Portable jig saw Portable electric drill Power plane Hand disc sander Hand vibrating sander Hand belt sander Portable router Pneumatic chisel Ground (wire)	Recognize common power tool sizes: skill saws 4" - 7 1/4" or 8" (diameter on the blade) radial arm 8"-12" (diameter on the blade) panel saw 8" (blade diameter) Interpret the amp rating of a portable power tool and convert it to a horsepower rating.	• Make sure instructor okays the use of tool independently. • Discuss brand names such as Black and Decker, Craftsman, Skil, Rockwell, Powercraft, Lufhin, Stanley, Commercial Heavy Duty. • Stress safety in operation of power hand tools such as saw guards, etc. • Observe safety rules. • Teacher and deaf student should cooperatively develop some simple signs related to language of the task. • Suggest to parents that tasks be reinforced and experienced in the home environment.

Supportive Instructional Materials:

Catalogue of brand name tools
Stanley films, 16mm, film loops, charts
Instructor's favorite text

SUBCLUSTER: SOFT MATERIAL PROCESSES

Code: MFG - SM09 TASK: Maintain hand and power tools

Student Name: ____________________

Student Progress	Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. provide for hand and power tool maintenance by performing the following: a. wipe tools clean following use b. keep tool handles tight c. keep tool edges sharp by honing, grinding, and filing d. set saws.	• Teacher presents class demonstration on care and maintenance of individual hand and power tools. • Students review maintenance techniques and procedures illustrated in texts. • Students prepare a bulletin board display illustrating the importance of maintaining tools. • Para-professionals provide sustained involvement with students having difficulty with this task.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 3,9	Modern Carpentry, pp. 20-22	13	9
NUMBERS	Modern Power Tool and Woodworking Book	13	31
APPLICATION C 5,8	"Getting the Most From Your Home Power Tools" (booklet)	13	27
PHYSICAL D 1a,b,d,f 2a/b 3c,f	"Care and Use of Hand Tools" Part I, II, III, IV	8	

Code: MFG - SM09 SUBCLUSTER: SOFT MATERIAL PROCESSES

TASK: Maintain hand and power tools

Basic Information for Cooperative Teaching			Suggestions:
Language of the Task		Quantitative Concepts	
Portable	Kerf	Determine the number of teeth per inch (points).	• Safety
Stable	Tool insignia	Recognize sharpening angles (15°-16°, 30°, 45°, 90°)	• Importance of tool exchanges and returning to storage.
Sharpen	Brace	Discuss tool prices in relation to quality (i.e. foreign made vs. American made).	• Tool casts
3-prong plug	Auger bits	Recognize auger bit sizes #4-16. The numbers 4-16 represent the diameter of the bit in 16ths of an inch. i.e. a no. 8 drill is 8/16" of 1/2" in diameter.	• Drill deaf student extensively on language of the task.
Ground	Forged steel		• Suggest to parents that tasks be reinforced and experienced in the home environment.
3 phase wiring			
Honing			
Grinding			
Set the saw			
Edges			
Filing			
Handles			
Tight			
Teeth #/"			

Supportive Instructional Materials:

Wall charts by Stanley, Sears, Craftsman, Lufhin, Starratt
General Motors film on "ABC's of Handtools"

SUBCLUSTER: SOFT MATERIAL PROCESSES

Sheet 1 of 1

Code: MFG - SM10 TASK: Utilize linear, square, and cubic measures of materials

Student Name: ______________

Student Progress: Introduced	Involved	Productive	Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
				Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify common linear measurements to include feet, inches, and fractions. 2. identify common square measurements to include square yards (carpet), square feet (plywood) and squares (roofing). 3. identify common cubic measurements to include cubic yards (concrete) and board feet. 4. compute the needed linear, square, and cubic sizes of materials for a given practical application or problem accurately.	• Special education or supportive teacher should introduce and reinforce basic math concepts. • Students measure and determine sizes of construction materials found in the lab. • Teacher discusses the importance of using linear, square, and cubic measures by using floor plans and referring to the bill of materials designating sizes of construction materials. • Teacher matches successful students who are interested in helping those having difficulty.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 3,7	Modern Carpentry, p. 61	13	9
NUMBERS B 1,2,4a,5,6	Estimating for Building Trades	13	1
APPLICATION C 3,5			
PHYSICAL			

SUBCLUSTER: SOFT MATERIAL PROCESSES

Code: MFG - SM10 TASK: Utilize linear, square, and cubic measures of materials

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Cubic Square Formula Multiply Divide	Measure lengths of materials in the room in inches (pencil) in feet and inches (length of room). Measure lengths and widths in inches (sheets of paper) in feet and inches (table top). Discuss linear measurement as it relates to the number of feet of string on a ball of kite string. Figure square measurements of a table top, floor surface area, or a pane of glass. Compute the volume of air in the room in cubic feet. Note: round off length, width, and thickness measurements to full feet before computing cubic volume to avoid the mathematical frustrations which often contaminate the concept being taught.	• Ask Construction and Trades instructors for random sizes and shapes of commonly used building materials i.e. plywood - 1/4, 1/2, 3/4; dimension lumber - 1x4, 1x6, 1x8, 2x4, etc. • Purpose of these scraps is to discuss measurements accuracy and tolerance, as well as measuring. • Speak distinctly and slowly, use simple sentences, and look directly at lip reading deaf students. • Informally encourage voluntary buddy system for assisting deaf students (individualize without calling attention to the individual). • Develop simple problems for students to solve.

Supportive Instructional Materials:

Scraps of building construction materials supplied by the building trades instructor(s).

SUBCLUSTER: SOFT MATERIAL PROCESSES

TASK: Operate power sanders

Code: MFG - SM11

Student Name: ______

Student Progress (Introduced / Involved / Productive / Employable)	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify the use of different types of sanding machines: a. horizontal belt type sander b. disc sander c. spindle sander d. portable electric finishing sanders: 1) belt 2) orbital 3) oscillating. 2. identify the component parts of sanders a. base d. belts b. table e. spindles. c. disks 3. describe the types, classifications, and applications of specific abrasives: a. grit size and kind b. backing material. 4. demonstrate the procedures/techniques for: a. installing an abrasive belt. b. installing an abrasive disk. c. installing abrasive paper on a portable sander. d. making adjustments on sanders. e. sanding specific shapes. 5. observe specific safety precautions for operation of sanders.	• Students can develop skills in operation of power sanding equipment by utilizing the equipment in building an individual product or in a class mass production. • Students view film loops and slides. • Teacher demonstrates power sander operations. • Teacher encourages small peer group cooperation and interaction.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE	"The Belt Sander"	9 10	7 32
A 3,4,7,9	"The Disc Sander"	9 10	7 32
NUMBERS	"Sanding"	5	16
B 4a	"Belt Sanding"	12	7
APPLICATION C 5	"Finishing Sanders"	12	7
PHYSICAL D 1a,b,d 2b,c 3c	Woodworking Technology, Section 9	13	12
	Practical Carpentry	13	9

SUBCLUSTER: SOFT MATERIAL PROCESSES

Code: MFG - SM11 TASK: Operate power sanders

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Orbital Oscillating Grit Abrasive Scratcher Straight line Flint Garnet Aluminum oxide Silicon carbide	Determine grit size. Recognize various sander sizes as determined by sizes of belts (i.e. a 6" x 24" sander has a belt 6" wide and 24" long). Recognize common disk sizes related to disk sanders (i.e. 6", 8", 10", 12").	• Students could make a notebook with different abrasive samples. • Emphasize the need to be careful in following safety precautions.

Supportive Instructional Materials:

Modern Woodworking

Exhibit of sanders (look at but do not operate until in vocational education class).

Samples of different size sandpaper or abrasive to look at and feel to relate to size and use.

SUBCLUSTER: SOFT MATERIAL PROCESSES

TASK: Operate power routers

Code: MFG - SM12

Sheet 1 of 1

Student Name: ____________

Student Progress (Introduced / Involved / Productive / Employable)	Behavioral Task Knowledges/Task Skills
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify the basic types of routers: a. production router b. portable router c. radial router. 2. identify and describe the accessories commonly used with a router: a. circle attachment b. straight edge attachment c. door hinge template d. laminate edge trimmer e. power plane. 3. identify and describe various router cutters. 4. demonstrate the following job skills in performing router operations: a. freehand grooves b. template usage c. shaping edges d. trimming laminates (plastic) e. planing f. cutting various joints. 5. observe specific safety precautions for router operations.

Instructional Methods

- Students can develop skills in operating routers by utilizing the equipment on individual products or in a class mass production activity.
- Teacher demonstrates the common router operations.
- Students view film loops and film.
- Para-professionals provide sustained involvement with students having difficulty with this task.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE			
A 3,4,7,9	"Overarm Router" (series of 4)	9	7
NUMBERS			
B 4a	"Overarm Router"	8	7
APPLICATION	Practical Carpentry	13	9
C 5			
PHYSICAL			
D 1a,b,d 2b,c 3c			

SUBCLUSTER: SOFT MATERIAL PROCESSES

Code: MFG - SM12 TASK: Operate power routers

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Router Cutter Attachment Laminate Template Rabbet joint Dovetail joint Dada joint Tongue and groove joint	Be able to match blades with different cuts in stock. Recognize various cutters by size and by shape. Discuss the importance of accuracy (1/32") for the various joints made with a router.	• Take students on a trip to construction sight to observe doors and door jambs and counter tops being routed. • Emphasize safety as related to wearing safety glasses and being careful.

Supportive Instructional Materials:

SUBCLUSTER: SOFT MATERIAL PROCESSES

TASK: Operate a drill press

Code: MFG - SM13

Sheet 1 of 1

Student Name: ____________

Student Progress: Introduced / Involved / Productive / Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. recognize the basic types of drill presses: a. floor model b. bench model. 2. describe the function of each of the principal parts of a drill press: a. column b. table c. chuck d. feed lever e. quill f. head g. spindle lock h. speed adjustment. 3. perform the following job skills in operating a drill press: a. drilling b. reaming c. routing d. sanding. 4. observe specific safety precautions for operation of a drill press.	• Students can develop skills for operating a drill press and a portable drill by the actual operation of the equipment in conjunction with an individual product or a class mass production activity. • Students view illustrated text materials. • Teacher demonstrates the safe operation of both a drill press and a portable electric drill.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 1,9	Woodworking Technology, Topics 96,97	13	12
NUMBERS B 2b, 4a,b	"Drills and Drilling"	10	32
APPLICATION C 5	"Drill Press"	10	32
PHYSICAL D 1a,b 2c	"The Drill Press"	8	20
	"Power Drills for Woodworking"	8	20

SUBCLUSTER: SOFT MATERIAL PROCESSES

Code: MFG - SM13 TASK: Operate a drill press

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Chuck Chuck key Drilling Counter sinking Mortising Sanding Routing Drills	Recognize various common drill size diameters (i.e. 1/8", 1/4", 3/8", 1/2", 5/8", 3/4", 7/8", 1", etc.). Discuss the concept of large drills revolve slow, and small drills revolve fast.	• Students could handle and practice naming the different sizes of bits. • Emphasize the necessity of safety glasses and careful conscientious use of drilling equipment.

Supportive Instructional Materials:

Collect drills or wooden power rods of common drill sizes.

SUBCLUSTER: SOFT MATERIAL PROCESSES

TASK: Operate a jig saw

Code: MFG - SM14

Student Name: ____________

Student Progress	Behavioral Task Knowledges/Task Skills	Instructional Methods
Introduced / Involved / Productive / Employable	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. locate and describe the basic component parts of a jig saw: a. table b. frame c. four-step pulley d. upper chuck e. lower head f. tension sleeve g. hold down guard h. throat plate. 2. demonstrate the following job skills in performing jig saw operations: a. angle sawing b. irregular curves. 3. observe specific safety precautions for jig saw operations.	• Teacher makes contact with each student during the class period. • Students can develop skills in operating the jig saw by operating the equipment with an individual project or as part of a class production activity. • Students review illustrated text materials. • Teacher demonstrates the operation of the jig saw.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 3,4,7,9	"Jig Saw"	10	32
NUMBERS B 4a	Woodworking Technology, Topics 45,46	13	12
APPLICATION C 5	Modern Woodworking	13	9
PHYSICAL D 1a,b,c,d 2b,c 3c			

SUBCLUSTER: SOFT MATERIAL PROCESSES

Code: MFG - SM14 TASK: Operate a jig saw

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Belt Cone pulley Blades, course, medium, fine Saber blade Jeweler's blade	Recognize common blades, fine, medium, and course.	• Students take a field trip to an older home to look at the gingerbread work that use to be used in construction. • Emphasize the need for wearing safety glasses and abiding by safety rules.

Supportive Instructional Materials:

Large drawing of a jig saw with parts identified.

SUBCLUSTER: SOFT MATERIAL PROCESSES

Sheet 1 of 1

TASK: Operate a surfacer planer

Code: MFG - SM15

Student Name: ______________________

Student Progress (Introduced / Involved / Productive / Employable)	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. describe the procedures/equipment for set-up of a surfacer: a. adjust feed mechanism and height b. select feed control. 2. identify and describe the function of surfacer components: a. table b. feed mechanism c. base d. thickness control hand wheel e. feed control. 3. plane solid wood materials to specified thicknesses. 4. observe specific precautions for surfacer operation.	• Students can develop skills for operating a surface planer by actual operation of the equipment as part of an individual product or a class mass production activity. • Teacher demonstrates the safe operation of a surface planer. • Teacher matches successful and interested students with those who are having difficulty.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 3,4,7,9 NUMBERS B 4a APPLICATION C 5 PHYSICAL D 1a,b,d 2b	Woodworking Technology Modern Woodworking	13 13	12 9

SUBCLUSTER: SOFT MATERIAL PROCESSES

Code: MFG - SM15 TASK: Operate a surfacer planer

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Infeed Outfeed Thickness	Practice measuring in fractions of an inch as related to checking for board thickness after planing.	• Stress the need for wearing safety glasses and following all safety precautions while planing.

Supportive Instructional Materials:

SUBCLUSTER: SOFT MATERIAL PROCESSES

Sheet 1 of 1

TASK: Operate a jointer

Code: MFG - SM16

Student Name: ______________

Student Progress: Introduced / Involved / Productive / Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify and describe the procedures/equipment for set up of jointer. 2. identify essential jointer parts: a. infeed table b. outfeed table c. fence d. cutter head and cutters. 3. perform the following job skills in jointer operations: a. jointing board edges b. surface planing. 4. observe specific safety precautions for jointer operation.	• Students can practice skill development in jointer operation by operating the equipment, in conjunction with an individual project or a class mass production activity. • Students view film and film loops. • Teacher demonstrates the safe operation of a jointer.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 3,4,7,9	"Jointer" (series of 4)	9	7
NUMBERS B 4a	"Jointer"	8	7
APPLICATION C 5	Woodworking Technology, Topics 72, 73, 74	13	12
PHYSICAL D 1a,b,d 2b/c 3c	Modern Woodworking	13	9

SUBCLUSTER: SOFT MATERIAL PROCESSES

Code: MFG- SM16 TASK: Operate a jointer

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Infeed table Outfeed table Cutters Fence	Recognize the size of a jointer by the length of the cutter head (i.e. 4", 6", 8", 12", etc.).	• Emphasize the need for safety glasses and the importance of following all safety rules.

Supportive Instructional Materials:

SUBCLUSTER: SOFT MATERIAL PROCESSES

TASK: Operate a circular saw

Code: MFG - SM17

Sheet 1 of 1

Student Name: ____________

Student Progress (Introduced / Involved / Productive / Employable)	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify and describe the procedures for set-up of circular saw: a. crosscutting b. ripping c. dado cutting. 2. describe the basic parts of a circular saw: a. table b. fence c. miter cross slide d. guard e. blade and handwheels. 3. demonstrate the following job skills in performing circular saw operations: a. ripping b. crosscut c. dado. 4. observe specific safety precautions for circular saw.	• Teacher demonstrates the safe operation of a circular saw. • Students can develop skills in the operation of a circular saw during the construction of an individual product or if the equipment is operated as part of a class production activity. • Students view transparencies, sound/slide programs, and illustrated text.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 3,4,6,7,9	"Circular Saw"	12	7
NUMBERS B 4a, 5, 6	"Circular Saw" (series of 6)	9	
APPLICATION C 7,8	"Straight Sawing"	5	16
PHYSICAL D 1a,b,d 2b 3c,g	<u>Woodworking Technology</u>, Topics 48, 49, 50	13	12

SUBCLUSTER: SOFT MATERIAL PROCESSES

Code: MFG - SM17 TASK: Operate a circular saw

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Dado Ripping Crosscutting Kickback Miter gauge Table Guard Fence Switch Blade raising wheel Mitering	Learn technique of measuring accurately between two points in inches and in fractions of an inch.	• Teacher could explain the importance of using guards on the saw. • Visit the woodworking laboratory so students can observe the use of guards and gauges and the need for safety.

Supportive Instructional Materials:

Modern Woodworking

SUBCLUSTER: SOFT MATERIAL PROCESSES

Sheet 1 of 1

TASK: Operate a band saw

Code: MFG - SM18

Student Name: ____________

Student Progress: Introduced	Involved	Productive	Employable	Behavioral Task Knowledges/Task Skills
				Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify and describe the function of component parts of band saws: a. wheels b. table c. upper/lower guards d. blade guides e. tension adjustments. 2. demonstrate the procedures for adjustment of a band saw: a. blade tension adjustment b. adjusting blade guide c. adjusting table. 3. demonstrate the following job skills in operating band saw: a. freehand sawing b. ripping c. crosscutting d. resawing e. irregalar/circular sawing. 4. observe specific safety precautions for band saw operation.

Instructional Methods

- Students can develop skills in operating a band saw by operating the equipment while completing an individual product or as part of a class production activity.
- Students view films, filmstrips, and film loops.
- Teacher encourages small peer group cooperation and interaction.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 3,4,7,9	"Band Saw"	8	7
NUMBERS B 4a	"The Band Saw" (series of 3)	9	7
APPLICATION C 5	"Curved Sawing and Drilling"	5	16
PHYSICAL D 1a,b,d 2c,b 3c	Woodworking Technology, Topics 54, 56, 57	13	12
	Modern Woodworking	13	9

SUBCLUSTER: SOFT MATERIAL PROCESSES

Code: MFG - SM18 TASK: Operate a band saw

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Wheels Upper/lower guards Tension adjustment Relief cuts	Recognize or measure band saw sizes. Use tension scale as related to blade thickness chart.	• Emphasize the need to wear safety glasses and to follow all safety precautions. • Have students count the number of teeth per inch on several different types of blades.

Supportive Instructional Materials:

Pictorial drawing of band saw identifying the basic parts.
"Practical Carpentry"

SUBCLUSTER: SOFT MATERIAL PROCESSES

TASK: Operate a wood lathe

Code: MFG- SM19

Student Name: ______________

Student Progress: Introduced	Involved	Productive	Employable

Behavioral Task Knowledges/Task Skills

Given the necessary tools, materials, equipment, and requisite knowledge, the learner will:

1. identify the procedures/equipment for set-up:
   a. head stock
   b. tool rest
   c. tailstock
   d. faceplate attachment.

2. identify and describe the basic types of lathe operations:
   a. spindle turning
   b. faceplate turning.

3. identify the common tools:
   a. roundnose
   b. skew
   c. gauge
   d. parting tool.

4. demonstrate the following job skills in performing wood lathe operation:
   a. rough cutting
   b. smoothing with skew chisel
   c. making a parting cut
   d. making a cove cut
   e. cutting a shoulder
   f. making V cuts
   g. cutting beads
   h. sanding
   i. post-block turning
   j. turning a bowl or tray on face-plate
   k. cutting a deep bowl.

Instructional Methods

- Students view films and film loops.
- Teacher demonstrates the safe wood lathe operation for spindle and faceplate turning.
- Teacher concentrates his effort with students having difficulty.
- Para-professionals provide sustained involvement with students having difficulty with this task.

Task-Related Competencies

KNOWLEDGE
A 3,6,7,9

NUMBERS
B 4a, 5, 6

APPLICATION
C 5,7,8

PHYSICAL
D 1a,b,c,d,f 2b

Instructional Materials

Title	Media	Bib.
"The Lathe-Spindle Turning"	10	16
"The Lathe-Faceplate Turning"	10	16
"Using Lathes"	9	6
"Wood Turning Lathe"	8	
"Wood Turning Lathe Series" 13 loops	9	18

SUBCLUSTER: SOFT MATERIAL PROCESSES

Code: MFG - SM19 TASK: Operate a wood lathe

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Tailstock Headstock Tool rest Face plate Handwheel Parting tool Gauge Skew Roundnose Inside caliper Outside caliper Concave Convex	Locate the center or a square by intersecting the diagonals. Discuss the concept of small diameter stock rotates at a faster spindle speed and large diameter stock rotates at a slower speed.	• Emphasize the need to wear a face mask and to follow all safety precautions.

Supportive Instructional Materials:

Labeled blow up pictorial drawing or photograph

SUBCLUSTER: SOFT MATERIAL PROCESSES

TASK: Operate a wood shaper

Code: MFG - SM20

Sheet 1 of 1

Student Name: ____________

Student Progress: Introduced / Involved / Productive / Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify and describe the function of component parts of shaper: a. table b. spindle c. spindle height wheel d. fence e. cutters f. collars. 2. demonstrate the basic procedure for adjustment of a shaper: a. interchange of spindles b. assemble cutters c. fastening and adjusting fence guide d. adjusting safety clamps e. raising or lowering spindle. 3. demonstrate the following job skills in operating a shaper: a. shaping straight edges b. shaping irregular edges c. shaping circular edges d. shaping with an outline pattern e. shaping with jigs and special forms. 4. observe specific safety precautions for shaper operation.	• Students can develop skills in operation of the shaper by operating the equipment on individual projects or as part of a class production activity. • Students view film loop series. • Teacher matches successful and interested students with those who are having difficulty.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 3,4,7,9 NUMBERS B 4a APPLICATION C 5 PHYSICAL D 1a,b,d 2b,c 3c	"The Shaper" Modern Woodworking	9 13	7 9

SUBCLUSTER: SOFT MATERIAL PROCESSES

Code: MFG - SM21 TASK: Operate a wood shaper

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	Quantitative Concepts	
Table Fence Cutters Spindle Guard	Recognize common cutter sizes and shapes.	• Emphasize the need to wear a face mask and to follow all safety precautions.

Supportive Instructional Materials:

SUBCLUSTER: SOFT MATERIAL PROCESSES

TASK: Employ wood fasteners

Code: MFG - SM21

Student Name: ____________

Student Progress (Introduced / Involved / Productive / Employable)	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. identify by name the common types of wood fasteners: a. wood glue b. nails c. wood screws d. hinges e. irons, braces, and plates f. hand screw clamps g. bar clamps h. c-clamps. 2. describe the typical application of each of the identified fasteners. 3. name the different availability sizes/types of the identified fasteners. 4. select the appropriate tools for inserting wood screws and nails for a given application. 5. select the appropriate size or type of fastener for a given application. 6. demonstrate the appropriate techniques for setting up and using clamps: a. bar b. c c. hand screw. 7. follow a prescribed procedure for applying glues and assembling glues and assembling glued materials.	• Students collect, label, and display all different types and sizes of wood fasteners. • Students review and discuss illustrated text materials in small groups. • Teacher makes contact with each student during the class period.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 1,7	Woodworking Technology, Section 13	13	12
NUMBERS	Modern Woodworking	13	9
APPLICATION C 5,8			
PHYSICAL D 1a,b 2b			

SUBCLUSTER: SOFT MATERIAL PROCESSES

Code: MFG - SM21 TASK: Employ wood fasteners

Basic Information for Cooperative Teaching			Suggestions:
Language of the Task		Quantitative Concepts	
Nails	Shank	Recognize common nail sizes and types.	• Handle, sort, and discuss nails commonly used.
Common	Pilot	Recognize various wood screw sizes and types.	• Handle, sort, and discuss common screws.
Box			
Finish			
Brad			
Smooth			
Babbed			
Penny (d)			
Corrugated fastener			
Screws			
Flat head			
Round head			
Oval head			
Phillips			
Countersink			

Supportive Instructional Materials:

Collect a box of miscellaneous nails to be sorted.
Collect a box of miscellaneous screws to be sorted.

SUBCLUSTER: SOFT MATERIAL PROCESSES

TASK: Apply selected wood finishes

Code: MFG - SM22

Sheet 1 of 1

Student Name: ____________

Student Progress: Introduced / Involved / Productive / Employable	Behavioral Task Knowledges/Task Skills	Instructional Methods
	Given the necessary tools, materials, equipment, and requisite knowledge, the learner will: 1. follow prescribed procedures and techniques for preparing the surface for finishing: a. leveling b. smoothing c. finishing. 2. describe and demonstrate the different methods of applying finishes: a. brushing c. rubbing b. spraying d. dipping. 3. operate, prepare, and clean a spray gun. 4. prepare and demonstrate the application of the following finishes: a. oil paints b. acrylic paints c. oil and water stains d. sealers e. paste wood filler f. shellac g. varnish h. lacquer i. liquid and paste waxes. 5. follow prescribed procedures in cleaning paint brushes.	• Students select and practice the most appropriate finish for an individual project or group mass produced product. • Students review and discuss illustrated text information. • Teacher demonstrates appropriate finishing techniques and procedures and makes samples available of appropriate finishing materials.

Task-Related Competencies	Instructional Materials: Title	Media	Bib.
KNOWLEDGE A 7,9 NUMBERS B 4b,c,d, 5 APPLICATION C 5 PHYSICAL D 1a,b 2a/b 3c,f	Woodworking Technology, Section 18	13	12
	"Wood Finishes"	8	34
	"Wood Finishing, Part I and II"	10	11

SUBCLUSTER: SOFT MATERIAL PROCESSES

Code: MFG - SM22 TASK: Apply selected wood finishes

Basic Information for Cooperative Teaching		Suggestions:
Language of the Task	**Quantitative Concepts**	
Wood finishing Synthetic Hand rubbed Turpentine Linseed oil Mineral spirits Rotten stone Pumice stone Abrasive Thinner Alcohol Lacquer thinner Filler Vehicle Pigment	Estimate time in 15 minute intervals as related to drying time for finishes. Recognize various size containers including pints, quarts, gallons, and five gallons.	• Emphasize the importance of keeping containers sealed and in their proper place. • Observe all safety precautions.

Supportive Instructional Materials:

Collect samples of thinners to identify by odor.

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INSTRUCTIONAL MATERIALS BIBLIOGRAPHY

INSTRUCTIONAL MATERIALS BIBLIOGRAPHY

MANUFACTURING CLUSTER

Bib. Ref. No.	Company Name/Address	Title
1.	American Technical Society 848 East 58th Street Chicago, Illinois 60637	Forging and Forming Metals Estimating for Building Trades
2.	Avid Corporation P.O. Box 4263 East Providence, R.I. 02914	"Safety at Work" "Measuring Weight"
3.	Bausch and Lomb SOPD Division Bausch Street Rochester, N.Y. 14609	"It's Up to You"
4.	Chas. A. Bennett Co., Inc. 809 W. Detwiller Drive Peoria, Illinois 61614	Technical Metals
5.	Clausing Corporation 2006 N. Pitcher Kalamazoo, Mi 49001	Machine Shop Wall Charts (5)
6.	Coronet Instructional Films 65 E. South Water Street Chicago, Illinois 60601	"Listening With Your Senses" "Safe Shop" "Shop Measuring Instruments" "Using Lathes" "Using Drill Presses and Grinders"
7.	DCA Educational Products, Inc. 4865 Stenton Avenue Philadelphia, Pa 19144	"Uniplane" loop series "The Band Saw" "Band Saw" "Circular Saw" "The Shaper" series "Micrometers" series "Precision Measurement" series "Vernier Calipers" series "Bases of Measurement" series "Gauge Blocks" series "Plug, Ring, and Snap Gauges" "Dial Indicators" series "Pneumatic Gauges" series "The Belt Sander" "The Disc Sander" "Belt Sanding" "Finishing Sanders" "Overarm Router" loop series

7. continued DCA Educational Products		"Overarm Router" "Wood Turning Lathe" "Jointer" series "Jointer" "Arc Welding" series "Gas Tungsten Arc Welding System" "TG-3 Grinder" "Grinder" "The Shaper" series "Milling Machine" "The Milling Machine" loop series "Metalworking Lathe" loop series "Lathe" "Drill Press" "Drill Press" loop series "Injection Molder" "Extrusion" "Molding" "Power Tool Maintenance" series "Portable Drills"
8.	Educational Developmental Labs Division of McGraw-Hill 75 Prospect St. 284 E. Pulaski Road Huntington, N.Y. 11743	"Building Concepts in Mathematics" series
9.	Goodheart-Wilcox Co., Inc. 123 W. Taft Drive South Holland, Illinois 60473	<u>Modern Woodworking</u> <u>Modern Carpentry</u> <u>Modern Metalworking</u> <u>Modern Welding</u> <u>Practical Carpentry</u>
10.	Hobart Brothers Manufacturing Co. Hobart Square Troy Ohio 45373	"Types of Welds" "Examples of Good and Bad Welds" "Causes and Cures of Common Welding Troubles" "Welding Positions" "Arc Welding Electrode Selection Guide" Hobart Vest Pocket Guide
11.	McGraw Hill Book Company/ Text films Gregg Division 330 W. 42nd Street New York, N.Y. 10036	"Sharpening Hand Tools" "Care and Repair of Hand Tools" "Safety in the Shop" "Soldering" "Layout Using Marking Gauge" "Bench and Sheet Metal" "Wood Finishing, Part I and II" "Electric Arc Welding"

11. continued McGraw Hill Book Company

- "Oxyacetylene Welding and Cutting"
- General Metals
- Machine Tool Metalworking
- "Tool Grinder"
- "Layout and Cutting"

12. McKnight Publishing Company
P.O. Box 854
Bloomington, Illinois

- Metalwork: Technology and Practice
- Plastics Technology
- Woodworking Technology

13. Michigan State University
Instructional Media Center
East Lansing, Michigan 48823

- "How to Have an Accident at Work"
- "How to Have an Accident at Home"

14. National Safety Council
Safety Education and Training Div.
425 N. Michigan Avenue
Chicago, Illinois 60611

- safety posters

15. Rockwell International
Power Tool Division
448 N. Lexington Avenue
Pittsburg, Pa 15208

- Machine Shop Wall Charts

16. Singer/SVE
1345 Diversey Parkway
Chicago, Illinois 60614

- "Using Modern Mathematics" series
- "Layout and Measurement"
- "Straight Sawing"
- "Curved Sawing and Drilling"
- "Sanding"
- "The Lathe-Spindle Turning"
- "The Lathe-Faceplate Turning"
- "Metalworking"
- "Drilling, Tapping, and Threading"
- "Fractions: A New Approach"
- "Basic Electrical Principles"

17. St. Regis
Nifty Division
Birmingham, Ala

- Ruler - 9890
- Fractional-Decimal-Percent - 9870

18. Universal Education and Visual Arts
221 Park Avenue, South
New York, N.Y. 10003

- "Woodworking - Part I"
- "Wood Turning Lathe" series
- "Working with Sheetmetal"
- "The Engine Lathe" loop series
- "Basic Wiring"
- "The Generator and Motor"

19.	University of Michigan A-V Education Center 416 Fourth Street Ann Arbor, Michigan	"Fire" "Fire: What Makes It Burn" "Fires and Wires" "Verniers" "Micrometer" "Safety in the Shop" "How and Electric Motor Works" "Our Senses: What They Do For Us"
20.	Sterling Educational Films P.O. Box 8497 Universal City, Ca 91608	"Power Drills for Woodworking" "The Drill Press" "Lathe, The Metal" "Milling Machine" "Snips and Shears"
21.	U.S. Steel Corp.	"Knowing Is Not Enough"
22.	Wayne County Library A-V Department 33030 Van Born Road Wayne, Michigan 48184	"Planes" "Sharpening Chisels, Plane Irons, and Gauges"
23.	Serina Press 70 Kennedy Street Alexandria, Va 22305	"Carpentry Part I - Measuring, Marking, and Leveling Tools"
24.	Visual Instruction Productions 295 West Fourth Street New York, N.Y. 10014	"How to Use Measuring Tools" "Sharpening the Plane" "How to Use Hand Boring Tools"
25.	Stanley Tools Education Department 600 Myrtell Street New Britian, Conn 06050	Tool charts "Foot-Inch Graduation" "Bench and Folding Rules" "Try Square, Combination and Steel Squares" "Zig Zag and Zig Zag Extension Rulers" "T-Bevel and Angle Divider" "How to Use Planes"
26.	McIntyre, Inc.	"Planes and Their Uses"
27.	Howard W. Sams and Co., Inc. 4300 West 62nd Street Indianapolis, Indiana 46238	Carpentry and Builder's Guide, Vol. I "Getting the Most from Your Home Power Tools"
28.	Cenco Educational Films 2600 S. Kostner Avenue Chicago, Illinois 60623	"Power Tools"
29.	Bailey Film Associates 11559 Santa Monica Blvd. Los Angeles, Ca 90025	"Power Tools"

30.	General Motors Corp. 3044 West Grand Blvd. Detroit, Michigan 48238	"ABC'S of Handtools"
31.	Arco Publishing Company 219 Park Avenue, South New York, N.Y. 10003	Modern Power Tool and Woodworking Book
32.	Scott Education Division Holyoke, Mass 01040	"Disk Sander" "Belt Sander" "Drills and Drilling" "Drill Press" "Jig Saw" "Eye Protection" "Safety Inspection" "Training for Emergencies" "Maintaining a Safe Shop" "Layout Tools and Measuring Devices"
33.	Mafex Associates Inc. Box 519 Johnstown, Pa 15907	"Industrial Arts for the Educationally Handicapped"
34.	Sterling Films Div. of Walter Reed 241 East 34th Street New York, N.Y. 10016	"Wood Finishes" "Soldering" "Layout Tools for Metalwork"
35.	Airco Welding Products 17200 West Eight Mile Rd. Southfield, Mi 48075	Oxyacetylene Welding and Cutting, Instructional Course "The Guy Behind Your Back"
36.	Plastic Coating Corp. Technifax Education Division Holyoke, Mass 01040	Technifax Oxyacetylene Welding 72003-100 Oxyacetylene Welding (Pinder and Masson)
37.	Air Reduction Co., Inc. 150 East 42nd Street New York, N.Y. 10017	Oxyacetylene Welding and Oxygen Cutting Instruction Course
38.	Jam Handy School Service, Inc. 2781 E. Grand Blvd. Detroit, Michigan 48211	"Basic Electric Arc Welding"
39.	L.S. Starrett Company Crescent Street Athol, Mass 01331	Precision tool wall charts

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APPENDIX

INSTRUCTIONAL MATERIALS CODE

MEDIA CODE/INDEX

Probable Learning Sensations

Code	Media	Vis.	Aud.	Tac.	Kin.	Ole.	Sav.
1	Demonstration with real objects/materials	x	x	x	x	x	x
2	3-D models - Mockups	x	x	x	x	x	x
3	Games - Simulators	x	x	x	x	x	x
4	Sound/Slide Programs	x	x				
5	Filmstrip - Cassette/Record	x	x				
6	TV - Broadcast, Closed Circuit	x	x				
7	Video and/or Audio Recorder	x	x				
8	Film, 16mm - BW/Color, Sound	x	x				
9	Film loop, 8mm	x					
10	Filmstrip	x					
11	Slides	x					
12	Overhead transparencies	x					
13	Books, Magazines, Texts, Booklets	x					
14	Pamphlets, Brochures, Manuals, Workbooks	x					
15	Newspapers, Cartoons	x					
16	2-D Displays, Charts, Graphs, Posters	x					
17	Drawings, Photographs, Schematics, Maps	x					
18	Opaque Projectuals	x					
19	Telephone, Intercom		x				
20	Other, specify						

BIBLIOGRAPHY REFERENCE

. . . complete ordering information for each of the commercially or teacher-produced instructional materials may be obtained by checking this reference number in the Instructional Materials Bibliography located in the back of the Cluster Guide.

TASK-RELATED COMPETENCIES

The task-related competencies are a summation of the specific skills, understandings, and/or attitudes that are necessary to satisfactorily accomplish the instructional tasks found in the ten cluster guides. The following listing is used for interpreting the Task-Related Competency code numbers found on each task sheet. A more detailed description of each of the identified competencies can be found either in the Program Guide or the Project Handbook.

A. SKILLS BASED ON KNOWLEDGE

1. Name one or more items
2. Request supplies and/or equipment
3. Check for accuracy and, if necessary, require correction of self and/or others
4. Discriminate sound cues, recognize normal sound as opposed to abnormal sound
5. Identity color
6. Identify form, size, shape, texture
7. Sequencing - Respond by pre-determined plan
8. Write identifying information of persons, places, and/or objects, serial no., weight, and/or types of products on slips or tags, etc.
9. Obtain information through sight, shape, size, distance, motion, color, and other unique characteristics
10. Discriminate olfactory cues

B. CONCEPT OF NUMBERS BASED ON KNOWLEDGE

1. Ordinal
2. Cardinal
   a. read numbers and/or copy
   b. count and/or record
3. Make change (money)
4. Measure
   a. distance
   b. weights - volume - balance
   c. liquids - solids
   d. time (measurement of)
   e. degrees of circle
   f. temperature, pressure and humidity
   g. torque
   h. electricity
   i. vertical-horizontal
5. Perform simple addition and/or subtraction
6. Perform simple multiplication and/or division

C. COMPREHENSION AND PERFORMANCE

1. Forms
   a. write
   b. file, post and/or mail
2. Match
   a. duplicate
   b. sort
3. Check lists and/or fill out report forms
4. Time awareness
5. Follow verbal symbol and/or written direction
6. Recognize words (not numbers) or ability to read and/or write
7. Depth perception
8. Ability to select most appropriate solution
9. Concept of distance

D. SKILLS BASED ON PHYSICAL ABILITIES

1. Fine Coordination
   a. coordinate eyes and hands or fingers accurately
   b. make precise movement
   c. move fingers to manipulate objects
   d. move hands skillfully - placing and turning motion
   e. coordinate hand and foot
   f. feeling - perceiving objects and materials as to size, shape, temperature, moisture content, or texture by means of touch
2. Strength (lifting, carrying, pushing, and/or pulling)
   a. sedentary work, 10# occasionally lifting and/or carrying small items such as tools, etc.
   b. light work, 20#, requires a significant amount of standing or walking
   c. medium work, lifting 50#, frequent lifting and carrying objects weighing 25#
   d. heavy work, frequent lifting and/or carrying up to 50#
   e. very heavy work - lifting objects in excess 100#, lifting and/or carrying objects weighing 50# or more
3. Gross Coordination (climbing and/or balancing)
   a. maintain body equilibrium to prevent falling when walking, standing, crouching, or running on narrow, slippery or moving surfaces
   b. ascend and descend ladders, stairs, scaffolding, ramps, poles, ropes, using feet and legs and/or hands and arms
   c. reaching - extending hands and arms in any directions
   d. crawling - moving on knees or hands and feet
   e. kneeling - bend legs at knees to rest on knee or knees
   f. stooping - bend downward and forward by bending legs and spine
   g. bending - downward and forward by bending at the waist